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Front cover Edible crab (*Cancer pagurus*), Eyemouth, Scottish Borders, 31st August 2024. (Photo: Leo Yokota)

Back cover Bohemian waxwing (*Bombycilla garrulus*) prior to migration, Alberta, Canada, 15th September 2024. (Photo: Rebecca MacArthur)

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Volume 28 Part 3

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EDITORIAL

It takes all sorts

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This issue of *The Glasgow Naturalist* contains nine normal articles (full papers and short notes). Since the previous issue contained 14 (excluding Scottish Herpetological Conference contributions), it appears that there is a continuation of the general decline in the submission rate over recent years that was discussed in the 2024 editorial. This is the lowest number of non-conference articles in an issue since the format of the journal was modernised in 1996, the zenith being in 2001 when Volume 23, Part 6 featured 25 full papers and seven short notes. Hopefully, this is not a long-term trend: a watching brief is required. Furthermore, it goes without saying that quality matters more than quantity. Despite being small in number, the articles pertain to several biomes – freshwater, marine and urban-terrestrial – and a reasonable range of taxa representing the three major Kingdoms of Life – Animalia, Plantae and Fungi – and including the human subjects of two biographical contributions.

The two papers with a biographical theme or sub-theme are a reminder that there are two main categories of naturalists: full-time professionals whose careers are devoted to one or more aspects of natural history, and part-time amateurs with full-time careers in an area of endeavour unrelated, or not closely related, to their specialist natural history interests. William Baird (1803-1872), the subject of Geoff Moore's paper (Moore, 2025), was, after leaving his career as a surgeon in 1841, an example of the former, working in the zoology department of the British Museum for 30 years and producing during that period over 90 publications on a wide range of natural history topics. On the other hand, one of the protagonists in Geoff Hancock's paper (Hancock, 2025) is Peter McDougall (1770-1814), who was a Glasgow medical doctor, amateur naturalist and discoverer of the roseate tern *Sterna dougallii*.

It is fascinating to note how the advancement of natural history knowledge has depended on both professional and amateur specialists during the nearly 260 years since the establishment in 1767 of the first Chair in Natural History in the British Isles at the University of Edinburgh, which could be viewed as the start of the "professionalisation" of the discipline. Unfortunately, the first appointee to this position – Robert Ramsay (1735-1778) – was a physician who "never lectured, treating his position as a complete sinecure" (Shapin, 1974).

Nineteenth century natural history was of course dominated by a certain professional of independent means – Charles R. Darwin (1809-1892), but there were by then many salaried professionals. Charles Wyville Thomson, for example, was Professor of Natural History in Queen's College, Cork and later in the University of Edinburgh, and is best known as the Chief Scientist on the Challenger Expedition (1872-1876), though he published many papers on other aspects of natural history (Balfour, 1883). The host of 19th century amateurs included David Robertson (1806-1896), "the Cumbrae naturalist" and the Reverend David Landsborough, the elder (1779-1854), "the Scottish Gilbert White", both of whom made significant contributions to marine natural history, geology and other areas. Both also eventually switched to professional status (as defined above), Robertson voluntarily after the sale of his Glasgow retail business and Landsborough involuntarily after losing his Stevenston church during the Great Disruption of 1843 (Anonymous, 1897; Moore, 2007).

In the 20th century, British lichenology underwent two episodes of revival aided by two remarkable women of Scots descent, one a professional and the other an amateur. Annie Lorrain Smith (1854-1937) was a mycologist who worked for most of her life in the botany department of the British Museum and produced a textbook (Smith, 1921a), the second edition of a two-volume monograph of British Lichens (Smith, 1918, 1926), and a handbook (Smith, 1921b) whose keys to all British lichens were, like the monograph, unsuperseded for 70 years (Creese, 2004; Maroske & May, 2018). Ursula K. Duncan (1910-1985) had a premier role in the post-World War 2 renaissance of British lichenology. Whilst her day-job was the management of the family estate near Arbroath, she provided over 25% of the Scottish lichen records in the 1953 *Census Catalogue* (Watson, 1953), was a founder member of the British Lichen Society in 1958, and wrote *Introduction to British Lichens* (Duncan, 1970), the successor to Annie Lorrain Smith's handbook (James, 1986). British

lichenology continues to be sustained by a healthy mixture of amateurs and professionals, as do other sub-disciplines: the 157 authors of *The Birds of Scotland* (Forrester *et al.*, 2007) are a good illustration of this.

In recent decades, a third category of naturalist has become increasingly prominent – the citizen scientist. The term "citizen scientist" usually refers to members of the public who contribute to scientific research on a topic of which they have no specialist knowledge, though there is considerable variability in this regard. For example, participants in a recent citizen science project on lichen diversity in Estonian forests "were not expected to be familiar with any lichen species" (Lõhmus *et al.*, 2023), whereas, at the other extreme, contributors to the Breeding Bird Survey are described as "skilled enthusiasts", and include individuals who have been submitting observations for 30 years (British Trust for Ornithology, 2024). Although it has been suggested that the "science" element is deficient in most citizen science projects (Davis *et al.*, 2023), citizen scientists have generated an enormous amount of valuable data through such endeavours as the Breeding Bird Survey, Big Butterfly Count (Butterfly Conservation, 2025) and National Plant Monitoring Scheme (NPMS, 2025). If natural history really is "a discipline in danger" (Nanglu *et al.*, 2023), citizen scientists should undoubtedly be part of the mix and every effort made to attract more of them, both for their potential to augment natural history knowledge and because they may be inspired to become tomorrow's specialist naturalists – amateur and professional.

This issue includes an obituary for Norman Tait (Downie & Weddle, 2025) who was a prominent member of GNHS, serving as President from 1996 to 1998. As recounted therein, Norman was both a professional photographer in the University of Glasgow and a respected wildlife photographer, and he helped with illustrations for *The Glasgow Naturalist* from 1994, when the journal first incorporated colour photographs, until 2002. Norman died in December 2024 and in that month we also lost David Palmar, who was another prominent member of the society and wildlife photographer, as well as long-standing photographic convener and Newsletter editor. Both Norman and David leave behind extensive archives of natural history photographs that will be lasting legacies.

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REFERENCES

Anonymous (1897). In memoriam - David Robertson, LL.D., F.L.S., F.G.S. *Transactions of the Natural History Society of Glasgow*. *New Series* 5(1), 18-42.

Balfour, J.H. (1883). Obituary notice of Sir C. Wyville Thomson. *Transactions of the Botanical Society of Edinburgh* 14, 1-4, 278-282. https://doi.org/10.1080/03746608309468413

British Trust for Ornithology (2024). Breeding Bird Survey celebrates 30 years of citizen science. https://www.bto.org/about-bto/press-releases/breeding-bird-survey-celebrates-30-years-citizen-science Accessed 7th April 2025.

Butterfly Conservation (2025). The big butterfly count 2025. https://butterfly-conservation.org/events/the-big-butterfly-count-2025 Accessed 7th April 2025.

Creese, M.R.S. (2004). Annie Lorrain Smith. *Oxford Dictionary of National Biography*. https://doi.org/10.1093/ref:odnb/46420

Davis, L.S., Zhu, L. & Finkler, W. (2023). Citizen science: is it good science? *Sustainability* 15, 4577. https://doi.org/10.3390/su15054577

Downie, J.R. & Weddle, R.B. (2025). Norman Tait FRPS: photographer, natural historian and past president of GNHS. *The Glasgow Naturalist* 28(3), 68-69.

Duncan, U.K. (1970). *Introduction to British Lichens*. T. Buncle, Arbroath.

Forrester, R.W., Andrews, I.J., McInerny, C.J., Murray, R.D., McGowan, R.Y., Zonfrillo, B. *et al.* (Editors) (2007). *The Birds of Scotland*. The Scottish Ornithologists' Club, Aberlady.

Hancock, E.G. (2025). Captain John Laskey, Dr Peter McDougall and the roseate tern, *Sterna dougallii* Montagu, 1813. *The Glasgow Naturalist* 28(3), 5-8. https://doi.org/10.37208/tgn28301

James, P.W. (1986). Obituary. Ursula Katherine Duncan. *Lichenologist* 18, 383-385. https://doi.org/10.1017/S0024282986000579

Lõhmus, P., Degtjarenko, P., Lotman, S., Copoţ, O., Rosenvald, R. & Lõhmus, A. (2023). "Ready! Set! Lichen!": a citizen-science campaign for lichens, against the odds of success. *Biodiversity and Conservation* 32, 4573-4765. https://doi.org/10.1007/s10531-023-02724-6

Maroske, S. & May, T.W. (2018). Naming names: the first women taxonomists in mycology. *Studies in Mycology* 89, 63–84. https://doi.org/10.1016/j.simyco.2017.12.001

Moore, P.G. (2007). *Marine Faunistics in the Clyde Sea Area: Fieldworkers in Cultural Context Prior to 1850*. Occasional Publication No. 9. University Marine Biological Station, Millport, Isle of Cumbrae.

Moore, P.G. (2025). In good company: an appreciation of the Scottish naturalist William Baird MD, FLS, FRS (1803–1872). *The Glasgow Naturalist* 28(3), 21-35. https://doi.org/10.37208/tgn28305

Nanglu, K., de Carle, D., Cullen, T.M., Anderson, E.B., Arif, S., Castañeda, R.A. *et al.* (2023). The nature of science: The fundamental role of natural history in ecology, evolution, conservation, and education.

Ecology and Evolution 13, e10621. https://doi.org/10.1002/ece3.10621

NPMS (2025). What is the National Plant Monitoring Scheme? https://www.npms.org.uk/ Accessed 7th April 2025.

Shapin, S. (1974). Property, patronage, and the politics of science: the founding of the Royal Society of Edinburgh. *British Journal for the History of Science* 25, 1-41. https://doi.org/10.1017/S000708740001284X

Smith, A.L. (1918, 1926). *A Monograph of the British Lichens*. British Museum, London.

Smith, A.L. (1921a). *Lichens*. Cambridge University Press, Cambridge.

Smith, A.L. (1921b). *A Handbook of the British Lichens*. British Museum, London.

Watson, W. (1953). *Census Catalogue of the British Lichens*. Cambridge University Press, Cambridge.

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FULL PAPERS

Captain John Laskey, Dr Peter McDougall and the roseate tern, *Sterna dougallii* Montagu, 1813

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ABSTRACT

The roseate tern, *Sterna dougallii* was described by Montagu in his 1813 *Supplement* to his *Ornithological Dictionary* in which he provided considerable detail on how the specimens came to him from Glasgow. Recent research by Mearns & Mearns has revealed biographical details of the finder, Dr Peter McDougall. This article provides further information on the role of Captain John Laskey leading to the publication of Montagu's description, and on preserved examples of the roseate tern from McDougall's collection that are additional to the type specimen.

INTRODUCTION

The roseate tern, *Sterna dougallii*, a rare summer visitor and breeding seabird in Scotland (Forrester *et al.*, 2007), was first described by George Montagu (1753-1815) in 1813 from a shot specimen and notes provided by Dr Peter McDougall (1777-1814), a Glasgow medical man and naturalist (Montagu, 1813). Montagu described the location of the specimen as "two small flat rocky islands, in the Firth of Clyde, called Cumbrey islands, in Milford Bay", by which he undoubtedly meant the small islands known as the "Eileans" in Millport Bay, Isle of Great Cumbrae, North Ayrshire (Forrester *et al.*, 2007).

The recognition and description of the roseate tern is a familiar story (Mearns & Mearns, 1988, 2022, 2023). Two elements are elaborated in this article. One explores the role of Captain John Laskey (*ca.* 1755-1826) in alerting Montagu in time for inclusion of the description of this new species in his 1813 *Supplement*. The other traces further preserved examples of the roseate tern connected with McDougall in addition to the type specimen, which were part of his extensive collection of birds.

McDougall's private museum was dispersed by auction on 15th July 1814 and contained 148 birds in twenty-six glass cases and 82 uncased mounts of British species. Thirteen cases with 100 birds, five un-cased birds, four mammals, four reptiles and two fish were non-British species (Anonymous, 1814). The majority of the latter were Neotropical and North American, and the large number of New World species suggests he relied principally on contacts in Glasgow's trans-Atlantic shipping trade for specimens. There is no evidence he travelled abroad to collect in person.

JOHN LASKEY

John Laskey was born in Devon, trained and practised as a lawyer, and while living there wrote numerous notes published in *The Gentleman's Magazine*. These demonstrated his wide interests and covered diverse subjects from observations on the migration of swallows, coins and local archaeological finds, to a stuffed kangaroo he had acquired (e.g. Laskey, 1796). As the Napoleonic war with France developed, in common with many citizens he volunteered with his local militia, the North Devon, in 1798. They trained alongside the Wiltshire Militia whose colonel was George Montagu, author of the *Ornithological Dictionary* (Montagu, 1802; Cleevely, 1978). It is likely, being near neighbours living in the Kingsbridge area of Devon, they were already acquainted through mutual natural history interests. In May 1795, Laskey married Maria Susanna Charlotte Dickinson, daughter of Richard Dickinson of the Office of Ordnance, Tower of London. Hers was a military family whose men mostly served in the regular army. Laskey bought a commission as a lieutenant in 1800 and in 1804 a captaincy with the 21st Kirkcudbright and Wigtown Militia, which resulted in him spending most of his time in Scotland. His interest in antiquarianism and natural history developed into a broad knowledge in a variety of subjects "by dint of reading and observation of museums and cabinets … minuting in a book kept on purpose" (Laskey, 1796). Mollusca were a particular interest of his (Laskey, 1811). In his later publications he added the name Coombe to his author line, which seems to have been an affectation (Laskey, 1818, 1819). It is possible he adopted this second name in admiration of Charles Coombe (1743-1817), a famous numismatist who wrote a catalogue of William Hunter's coin cabinet.

Part of the duties with his new regiment took him to East Lothian, where he resided for a while in Port Seton. Their duties included guarding Napoleonic prisoners of war many of whom were housed further south in Peebles. From 1811 he transferred with at least part of the regiment to Dumbarton Castle at Dumbarton Rock, until 1813. Here prisoners of officer rank were held

under stricter regimes. Laskey then was able to visit the recently opened Hunterian Museum built by the University of Glasgow in 1807 to house the bequest of William Hunter (1718-1783). In a notebook Laskey itemised those exhibits in which he had personal interest. The product of this activity came to the attention of the bookseller John Smith, son of the founder John Smith, of the eponymous company. Smith persuaded Laskey to provide his notes as a text for *A General Account of the Hunterian Museum* (Laskey, 1813) referred to below as the *Account*. Several such manuscript commonplace books (personal compilations of information) by Laskey are preserved in museums and libraries ranging across various subjects. His notes on the Hunterian Museum (now preserved with associated correspondence between Laskey and Smith in Cambridge University Library; Ref. Code: GBR/0012/MS Add.6306) lacked information on the medical collections and the library but were necessary for what Smith envisaged as a commercially viable visitors' guide. Following advice from Laskey, Smith contacted Dr Peter McDougall to supply the former and Smith's son (John Smith, the third) fulfilled the latter. Laskey's *Account* of the Hunterian dating from the first decade of its existence provides a valuable curatorial tool to this day, over 200 years later.

PETER MCDOUGALL'S ROSEATE TERN SPECIMENS

Laskey had become acquainted with Peter McDougall as part of the local naturalist community and so came to be in a pivotal position to alert Montagu to the discovery of an unusual tern in the Clyde area. The timing proved fortuitous - a description of the bird as a new species could be written in time to be included in his *Supplement* (Montagu, 1813). Montagu said "we must also include Captain Laskey in [acknowledgement] by whom we were first made acquainted that such a bird had been taken by, and was in the collection of Doctor M'Dougall, to whom he kindly communicated our wishes to examine it." The details provided initially by McDougall to Montagu are of an adult male, its sex established by dissection, and was one of two birds shot on 24th July 1812 by his "companion sportsmen". This became the holotype for the name *dougallii* and is preserved in the Natural History Museum, London (NHM) (Fig. 1).

In addition to the holotype, there was a young bird in the NHM originating from Montagu and labelled "Frith of Clyde, Dr M'Dougall" according to Leach (1816). This specimen can no longer be traced in the national collection (Mearns & Mearns, 2023). William Elford Leach (1791-1836) was instrumental in obtaining the collection of George Montagu for the British Museum. Details of the negotiations are given by Harrison & Smith (2008).

As Montagu had only one bird to hand in 1813, it would seem likely that the roseate tern discovery triggered more sampling by McDougall to supply demand from those wishing to possess examples. Several other specimens have come to light. There are two extant

Fig. 1. The holotype of roseate tern, *Sterna dougallii*. (A) The specimen. (B) Labels from holotype. (Photos reproduced by permission of Natural History Museum, Tring)

McDougall specimens that came to Liverpool Museum as part of Lord Derby's collection. The 13th Earl of Derby, Lord Edward Geoffrey Smith Stanley (1775-1851), built a massive collection of birds and mammals that became a major foundation for Liverpool Museum, which opened in 1851 (Woolfall, 1990). Mearns & Mearns (1988) first thought that, apart from the type, it was unlikely that other McDougall specimens still existed, but later they were informed of some specimens in Liverpool (Mearns & Mearns, 2023). These are from the collection of birds described by Fisher & Jackson (2002) as 28 foreign and 14 British cases of birds acquired from a "Dr McDougall". Some lots were bought for Lord Derby at the auction of McDougall's belongings, which was held in Glasgow in 1814. One was Case No. XI, described in the sale catalogue (Anonymous, 1814) as "Sterna Dougallii - Roseate Tern, two males and a female, A NEW SPECIES DISCOVERED BY DR. M'DOUGALL." and "Hirundo rustica – WHITE HOUSE SWALLOW". John Smith, the Glasgow bookseller, was engaged to bid on Lord Derby's behalf. He sent the results by letter, details of which are interesting for the relatively large sum fetched by the tern case and some other details provided by Smith (Letter from John Smith in Archive Department, National Museum of Liverpool). Smith wrote:

"The great object of competition was the case containing the Roseate Terns: To secure your Lordship the pair I was necessitated to promise the odd one [one of the males] & Swallow to a determined Collector, who would have gone above my price for the whole, conditionally that on resigning the competition, he should have them for the balance of the Sum, they might sell for, more than the charge stated above; - I have no doubt your Lordship will approve of this arrangement for, otherwise, I am confident they would have been lost. Dr M^{c}D is said only to have killed 7 birds in condition for preserving, and your Lordship is secured of the two finest, reserved for himself…"

The letter is annotated by Lord Derby with his catalogue numbers for the nine specimens he received from the auction; seven were other, mostly foreign, species. The roseate terns cost him eight guineas (£8-8s-0d; worth *ca.* £800 today), the other specimens collectively added up to only £5-17s-6d (*ca.* £600 today).

Henry Ogg Forbes (1851-1932), one-time Director of Liverpool Museum, said that one roseate tern specimen in the BM and two in Liverpool were the types of the species (Forbes, 1896-8). Forbes then quotes from a manuscript note by Lord Derby which stated that two were preserved by McDougall, a male and a female, and a third was given him directly from Montagu. This third specimen seems not to have survived. The two original mounts as received from John Smith's endeavours were made down into round skins (Fig. 2). Forbes' assertion that specimens in Liverpool were part of the type series was incorrect.

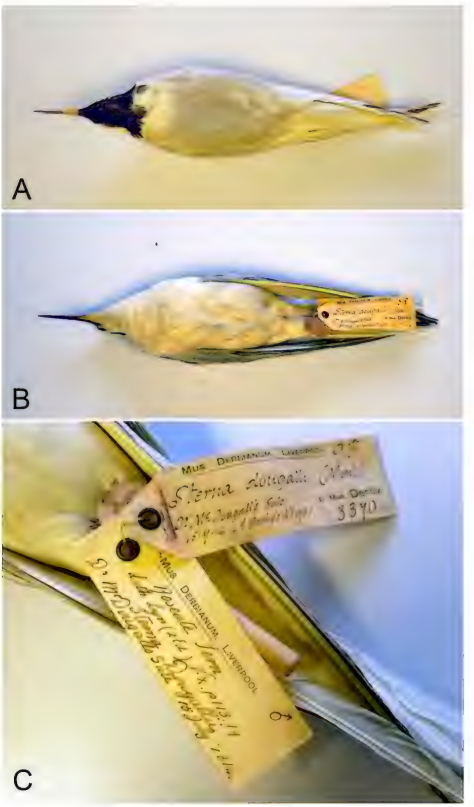

Fig. 2. Other specimens of roseate tern, *Sterna dougallii*, from Lord Derby's collection. (A) Specimen No. 931: a male. (B) Specimen No. 932: a female. (C) Labels from specimen No. 931. (Photos reproduced by permission of National Museums Liverpool (World Museum: NML-VZ D3370, NML-VZ D3370b and NML-VZ D3370a respectively))

If there were seven birds obtained by McDougall said by Smith to be suitable for preservation, to what extent can these be accounted for? One was sent to Montagu and is the type specimen for Montagu's name, *Sterna dougallii*. It was one of three mentioned by McDougall in communicating to Montagu in a second letter (his first letter referred to just two birds) that were "shot with many others, on the 24th of July, 1812, all of which are exactly alike". Leach (1816) catalogued a juvenile bird that Montagu must have acquired subsequently. One of the males in the glass case sold in Glasgow was acquired by an anonymous bidding competitor. The other two might have been those mentioned by McDougall in his second letter to Montagu. The third Liverpool specimen said by Forbes to have been received directly from Montagu might also have been got in 1813. Clearly, McDougall did return to the nesting site in that year to obtain more specimens, particularly the juvenile. He died, perhaps unexpectedly, aged only 37, in April, 1814, too soon to collect and preserve any more roseate terns in what would have been a third consecutive nesting season for the bird on the Cumbraes.

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REFERENCES

Anonymous (1814). *A Catalogue of a Choice Collection of British and Foreign Birds, Comprehending many Curious and Rare Specimens in High Preservation: the Entire Collection of the Late Dr. Peter M'Dougall, which will be Sold at Auction on Friday, July 15th, 1814, in the Hall of Mr Angus, Academy, Ingram Street, Glasgow*. (Glasgow University Library, Special Collections: Sp Coll RB 4832)

Cleevely, R.J. (1978). Some background to the life and publications of Colonel George Montagu (1753-1815). *Journal of the Society for the Bibliography of Natural History* 8(4), 445-480. https://doi.org/10.3366/jsbnh.1978.8.4.445

Fisher, C. & Jackson, C.E. (2002). The 13th Earl of Derby as a scientist. In: Fisher, C. (Editor). *A Passion for Natural History. The Life and Legacy of the 13th Earl of Derby*, pp. 45-51. National Museums and Galleries on Merseyside, Liverpool.

Forbes, H.O. (1896-1898). Order Gaviae. In: Butler, A.G. (Editor). *British Birds with Their Nests and Eggs, Vol. 6*. Brumby & Clarke, London.

Forrester, R.W., Andrews, I.J., McInerny, C.J., Murray, R.D., McGowan, R.Y., Zonfrillo, B. *et al.* (Editors) (2007). *The Birds of Scotland.* Scottish Ornithologists' Club, Aberlady.

Harrison, K. & Smith, E. (2008). *Rifle-Green by Nature: A Regency Naturalist and His Family, William Elford Leach*. Ray Society, London.

Laskey, J. (1796). A very fine stuffed skin (Gamgarou or Kangaroo) presented to my collection about three months since. *The Gentleman's Magazine* 1796, 467-468.

Laskey, J. (1811). Account of the North British Testacea. *Memoirs of the Wernerian Natural History Society* 1, 370-417.

Laskey, J. (1813). *A General Account of the Hunterian Museum Including Historical and Scientific Notices of the Various Objects of Art, Literature, Natural History, Anatomical Preparations, Antiquities, etc., in That Celebrated Collection.* John Smith & Son, Glasgow.

Laskey, J.C. (1818). *A Description of the Series of Medals Struck at the National Medal Mint by Order of Napolean Bonaparte, Commemorating the Most Remarkable Battles and Events During His Dynasty*. H.R. Young, London.

Laskey, J.C. (1819). *A Brief Description of the Marbles Collected by Lord Elgin at Athens &c, also of the Plagilian Marbles, now Deposited in the British Museum. A New Edition with Additions Arranged Conformably with the Numbers as they are now Placed in The Museum. The Whole Compiled from the Best Authorities*. Sherwood, Neels & Jones, London.

Leach, W.E. (1816). *Systematic Catalogue of the Specimens of the Indigenous Mammals and Birds that are Preserved in the British Museum, with their Localities and Authorities to which are Added a List of the Described Species that are Wanting to Complete the Collection of British Mammals and Birds*. The Willughby Society, London.

Mearns, B. & Mearns, R. (1988). *Biographies for Birdwatchers. The Lives of Those Commemorated in Western Palearctic Bird Names*. Academic Press, London.

Mearns, B. & Mearns, R. (2022). *Biographies for Birdwatchers. The Lives of Those Commemorated in Western Palaearctic Bird Names*. (2nd edition). Dumfries.

Mearns, R. & Mearns, B. (2023). George Montagu (1753-1815), travels in Scotland and his Scottish bird specimens. *Archives of Natural History* 50, 35-48. https://doi.org/10.3366/anh.2023.0826

Montagu, G. (1802). *Ornithological Dictionary*. J. White, London.

Montagu, G. (1813). *Supplement to the Ornithological Dictionary, or Synopsis of British Birds*. S. Woolmer, Exeter.

Woolfall, S.J. (1990). History of the 13th Earl of Derby's menagerie and aviary at Knowsley Hall, Liverpool (1806-1851). *Archives of Natural History* 17, 1-47. https://doi.org/10.3366/anh.1990.17.1.1

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Pollinator abundance and floral characteristics in six public parks in Glasgow, Scotland

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ABSTRACT
Global declines in both pollinators and plants are attributed to habitat loss, fragmentation, agrochemicals and climate change. Continued urbanisation is expected to further threaten species, requiring conservation of pollinator habitats in our towns and cities. The aim of this study was therefore to examine how floral species richness and floral abundance influenced pollinator abundance in parks in Glasgow, Scotland. Six sites were selected along an urban-to-peri-urban gradient (Kelvingrove Park, Botanic Gardens, Yorkhill Park, Victoria Park, Knightswood Park and Trinley Brae). Pollinator abundance and floral characteristics were recorded in quadrats along transects in June 2023. Results showed that pollinator abundance increased with floral species richness but not floral abundance. Parks had similar pollinator abundance with the exception of Victoria Park, where pollinator abundance was lower compared with other parks. This study demonstrates the importance of floral diversity to enhance pollinator communities and underpins the need for site-specific management to effectively support pollinators in public parks.

INTRODUCTION
Insect-mediated pollination networks are crucial to terrestrial ecosystem dynamics as they facilitate reproduction in 90% of angiosperms (Ollerton *et al.*, 2011; Klein *et al.*, 2007). Pollinators require access to plants for foraging resources and in return, as mobile intermediaries, pollinators play a key role in the reproductive success of these plants. However, both pollinator and plant populations are facing unprecedented challenges across the world, and these strong mutual interactions may be at enhanced risk of coextinction.

Declines in pollinator populations have been attributed to the loss, fragmentation and degradation of habitat, primarily due to urban and agricultural expansion, alongside agrochemical use and localised effects of global climate change (Goulson *et al.*, 2015; Ollerton *et al.*, 2014; Dicks *et al.*, 2016). There are also declines in flowering plant populations across the world (Potts *et al.*, 2016; Biesmeijer *et al.*, 2006) which may suggest a coextinction trophic cascade (Labandeira, 2002).

Urban expansion is accelerating globally with an estimated 68% of the human population expected to live in urban areas by 2050 (The United Nations, 2018). This will likely intensify land-use change and habitat degradation pressures with notable plant-pollinator feedback (Seto *et al.*, 2012; Newbold *et al.*, 2015). However, within towns and cities, urban greenspace can present considerable conservation potential for both pollinators and plants (Baldock *et al.*, 2019; Aronson *et al.*, 2014; Brom *et al.*, 2022). Beyond this, access to urban greenspace provides important ecosystem services to urban dwellers, acting as a natural buffer to filter air pollution while enhancing physical health outcomes and mental wellbeing (Mansor *et al.*, 2017; Li *et al.*, 2023).

A recent review by Wenzel *et al.* (2020) concluded that urban landscapes filter pollinator communities based on traits such as nesting and foraging strategy, sociality, body size and phenology, promoting cavity-nesters and generalists (polylectic) over ground-nesters and specialists (oligolectic). Furthermore, when impervious surface exceeded 50%, pollinator abundance and functional diversity decreased with urban expansion. However, following city sprawl with impervious surface below 50% (mainly peri-urban settings), pollinator abundance and functional diversity increased. These findings show good agreement with Baldock *et al.* (2015) where the diversity of hymenopterans was greater in urban areas than in farmland sites. It is suggested that species-rich assemblages of native and non-native plantings in heterogenous urban greenspaces may buffer the negative impacts of urbanisation on pollinators. These effects include exposure to pollution, the urban heat island effect and the biological effects of habitat fragmentation, including genetic drift, inbreeding depression and demographic stochasticity (Harrison & Winfree, 2015). Although pollinators are clearly sensitive to urbanisation, there are species-specific conservation opportunities in habitats within our towns and cities.

In the City of Glasgow, Scotland natural, semi-natural and the built environment offers a mosaic of key pollinator habitats (Lindsay, 2021). Grasslands and wildflower meadows are critical habitats, offering shelter and diverse nutrition (Hicks *et al.*, 2016). Leaf

litter and dead wood in woodland ecosystems provide overwintering habitat and support the reproductive success of pollinators with oviposition sites. Features such as bare ground and soil, rare in urban areas due to the proportion of sealed surfaces, are important habitat to ground-nesting pollinators such as solitary wasps and mining bees, attracting cuckoo species (cleptoparasites) (Celary *et al.*, 2007; Hinners *et al.*, 2012). Cracks and crevices in urban structures provide niche habitat opportunities and overwintering sites for cavity-nesting species. Canals, rivers and other linear landscape features may provide functional landscape connectivity throughout Glasgow as ecological corridors, while private gardens and smaller greenspaces may provide stepping-stone habitat, supporting pollinator metapopulation dynamics at city-scale. Freshwater and riparian ecosystems also provide key habitats, particularly for pollinators with aquatic larvae such as *Sericomyia silentis* (common bog hoverfly).

While literature searches highlight conservation successes in Glasgow (Hayhow *et al.*, 2016; Stewart *et al.*, 2017; Weddle, 2011), data on pollinators either predate implementation of conservation strategy or are dated (Bairner, 2011, 2012, 2013). Therefore, this study aims to examine the relationship between floral species richness, floral abundance and pollinator abundance in six public parks in Glasgow and will investigate differences between sites.

MATERIALS AND METHODS

Site selection

All urban greenspace within an 8 km radius of George Square, Glasgow (NS5926665399) were identified using ArcGIS mapping software (Glasgow City Council, 2017). Categories of urban greenspace were filtered to display only public parks. Site selection followed an urban-to-peri-urban gradient from George Square towards the west of the city and to the north of the river Clyde due to practicalities in data collection. Six public parks were therefore surveyed (Fig. 1; Table 1).

Sampling pollinators

Pollinators were counted by walking along each transect and recording the abundance of insect pollinators within each quadrat. Pollinators were recorded within each quadrat for two minutes, totalling ten minutes per transect. Each individual survey was repeated after an interval of five minutes to reduce disturbance to pollinators and allow any disrupted individuals to return to forage, providing two counts per transect. Maximum pollinator abundance was determined by taking the highest pollinator abundance recorded in each quadrat from the two separate counts. All pollinators present within the quadrat were included in abundance counts. All individuals seen to leave and re-enter the quadrat were not counted twice. Pollinators were recorded into four key functional Orders of Diptera (true flies,

Fig. 1. Public park study sites in Glasgow, Scotland (Google Earth Pro, 2024).

Site	OS grid reference	Area (ha)	Date surveyed
Trinley Brae	NS5324970127	6	16/06/2023
Knightswood Park	NS5302769638	11	16/06/2023
Botanic Gardens	NS5673867533	20	22/06/2023
Victoria Park	NS5404267314	20	24/06/2023
Yorkhill Park	NS5612566174	5	26/06/2023
Kelvingrove Park	NS5723066426	34	26/06/2023

Table 1. Public park study sites: locations, area and date surveyed (in chronological order of site-visit).

including hoverflies and others), Hymenoptera (sawflies, wasps, ants and bees) (Fig. 2), Lepidoptera (butterflies and moths) and Coleoptera (beetles). A total of 24 transects was surveyed with 48 transect walks over the duration of the study.

Fig. 2. Bumblebee (*Bombus* sp.) foraging in Botanic Gardens, Glasgow, 22nd June 2023. (Photo: R.F. Dubbels)

Data collection

Observations took place over a two-week period in June 2023 (Table 1) and only commenced when the air temperature was within the range 12-27°C, when the windspeed was ≤25 km h^{-1}, when cloud cover was ≤50 % and there was no precipitation.

Transect and quadrat sampling

Floral species richness and pollinator abundance were counted in each site using a 10 m transect line with five 1 m x 1 m quadrats randomly placed on alternating sides of the transect. Each individual transect/quadrat survey was repeated twice and replicated a total of four times throughout each site. Quadrat placement and the start point of each transect were selected using random number generation in R version 3.4.2 (R Core Team, 2023). The overall methodology is based on FIT (flower-insect timed) counts from the UKCEH (2021) and similar primary research (Baldock *et al.*, 2019; Westphal *et al.*, 2008). However, the results of this study are not directly comparable with FIT counts due to differences in sampling strategies and protocols.

Data analysis

All statistical analyses and data visualisations were undertaken in R version 3.4.2. Each figure was created using the Tidyverse package (Wickham *et al.*, 2019). A generalised linear mixed model (GLMM) was fitted with a Poisson distribution to predict maximum pollinator abundance with floral species richness, floral abundance and site as fixed effects. Transect was treated as a random effect in the model to account for non-independence along the same transect. The model was fitted using the glmer function in the lme4 package (Bates *et al.*, 2015). Residuals were inspected using the DHARMa package (Residual diagnostics for hierarchical regression models) to ensure the fit of the model (Hartig, 2022).

Assessment of model adequacy

DHARMa plots were inspected to ensure the GLMM's reliability in predicting maximum pollinator abundance. The Quantile-Quantile plot and non-significant Kolmogorov-Smirnov (KS), dispersion, and outlier tests indicate good agreement between observed residuals and a theoretical Poisson distribution, supporting the model's assumptions. In the Residuals vs Predicted plot, no discernible pattern or systematic deviation is observed, suggesting the model's predictions align well with the observed data. The Residuals vs Predictor plot and the significant combined adjusted quantile test highlight potential deviations in certain predictor variable ranges and suggests areas where the model may be less effective.

RESULTS

Predictors of maximum pollinator abundance and model overview

The GLMM marginal R^2 suggest the fixed effects alone explain 23.3% of the variance in maximum pollinator abundance and the conditional R^2, accounting for both fixed and random effects, suggests a total explanatory power of 51.2% (Table 2).

Pollinator abundance increased with floral species richness ($\beta = 0.13$, 95% C.I. = [0.02, 0.23], $P = 0.017$) (Figs. 3 and 4). The effect of floral abundance on pollinator abundance was not significant ($\beta = 0.0062$, 95% C.I = [0.000903, 0.01], $P = 0.087$) with floral abundance counts detailed in Table 3. Maximum pollinator abundance was significantly lower in Victoria Park relative to the intercept (Botanic Gardens) ($\beta = -0.69$, 95% C.I. = [-1.20, -0.18], $P = 0.008$). The effect of Trinley Brae was not significant ($\beta = -0.60$, 95% C.I. = [-1.22, 0.01], $P = 0.055$) but should be interpreted with caution as only marginally above the 5% threshold of significance. The effect of all remaining sites on pollinator abundance was not significant relative to the intercept (Table 2)

The estimated variances within transects ($\sigma^2 = 0.17$) and between transects ($\tau_{00\ Transect} = 0.09$) indicate notable variability in maximum pollinator abundance at this scale. The intraclass correlation value suggests 36% of the total variability in maximum pollinator abundance was due to differences between clusters/transects.

Differences in pollinator assemblages between sites

The abundance and proportion of individuals in the four pollinator orders varied notably between sites (Fig. 5). Diptera were the commonest order in all sites and were disproportionately high in Knightswood Park constituting 66% of the individuals counted. Hymenoptera were second to Diptera as the most abundant order in all sites and were most prominent in Botanic Gardens followed by Kelvingrove Park. Kelvingrove Park was the only site where hymenopteran and dipteran counts were similar, representing 39% and 36% of each total count, respectively. Lepidopterans

Predictors	Estimate	Standard error	Incidence rate ratio	95% C.I.	*P*
(Intercept)	1.62	0.21	5.03	3.32 – 7.63	<0.001
Floral species richness	0.13	0.05	1.14	1.02 - 1.26	0.017
Floral abundance	0.01	0.003	1.01	1.00 - 1.01	0.087
Site (Kelvingrove Park)	-0.06	0.25	0.94	0.57 - 1.55	0.823
Site (Knightswood Park)	-0.22	0.25	0.80	0.49 - 1.32	0.380
Site (Trinley Brae)	-0.60	0.31	0.55	0.30 - 1.01	0.055
Site (Victoria Park)	-0.69	0.26	0.50	0.30 - 0.84	0.008
Site (Yorkhill Park)	-0.09	0.25	0.92	0.56 - 1.51	0.734
Random effects					
σ^2	0.17				
$\tau_{00\ Transect}$	0.09				
ICC	0.36				
$N_{\ Transect}$	24				
Observations	120				

Table 2. GLMM model output. Estimates, standard errors, incidence rate ratios (IRRs), 95% confidence intervals (CIs) and p-values for the fixed effects of floral species richness, floral abundance and site. Variance components within (σ^2) and between ($\tau_{00\ Transect}$) transects and the intraclass correlation (ICC) are detailed.

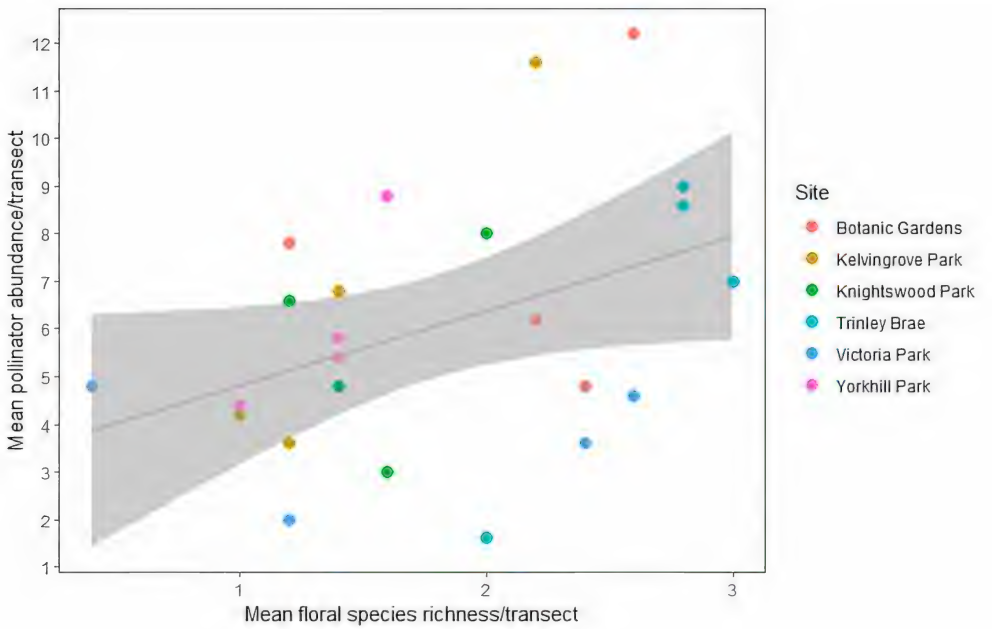

Fig. 3. Relationship between mean floral species richness and mean pollinator abundance/transect (n = 4 in all sites). Trendline fitted with simple linear regression. Shaded area represents 95% confidence interval.

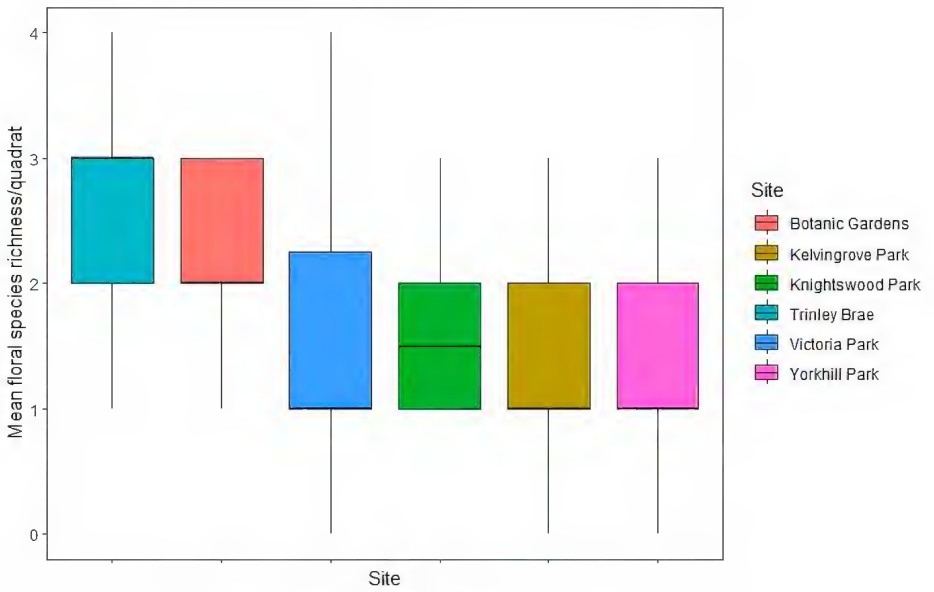

Fig. 4. Mean floral species richness/quadrat (n = 20 in all sites). Arranged in descending order of floral species richness. Quadrat size = 1 m^2. Median line situated at the top/bottom of a box represents skewed data and more extreme values. Absence of upper or lower whiskers in Botanic Gardens and Knightswood Park suggests no data beyond the 1.5 inter-quartile range.

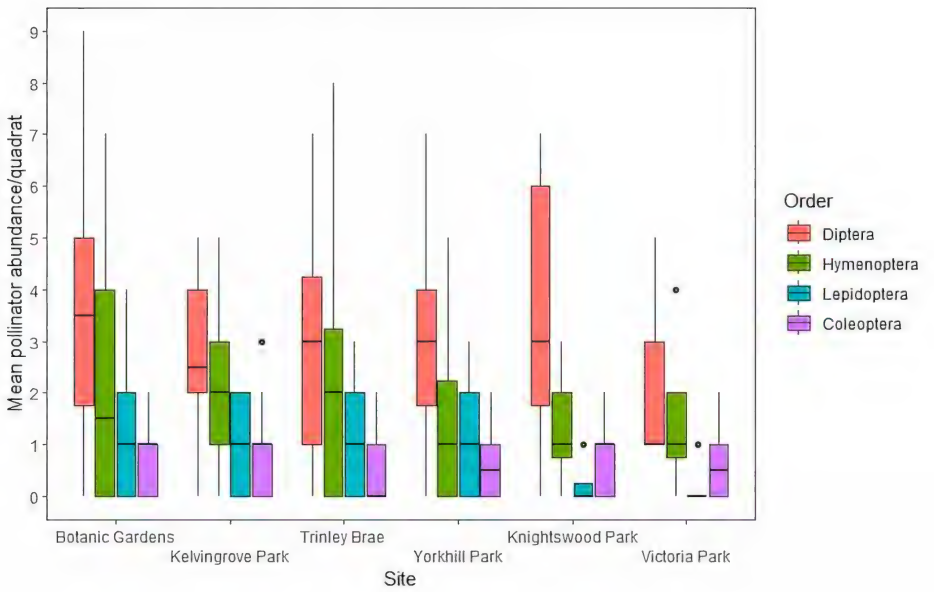

Fig. 5. Mean number of individuals of the four pollinator orders/quadrat (n = 20 in all sites). At each site arranged in descending order of maximum pollinator abundance. Quadrat size = m^2. Absence of upper or lower whiskers indicates no data points beyond the 1.5 IQR range. Black dots indicate outliers (>1.5 to <3 times the inter-quartile range) observed in coleopterans in Kelvingrove Park, lepidopterans in Knightswood Park, and hymenopterans and lepidopterans in Victoria Park.

were most abundant in Yorkhill Park where observations of Hymenoptera and Lepidoptera were proportional, representing 25% and 26% of counts, respectively. Knightswood Park and Victoria Park were the only sites where coleopterans were more abundant than lepidopterans, constituting 16% and 9% of counts, respectively. Lepidopterans were limited in Knightswood Park and Victoria Park, the sites least abundant in all pollinators, representing 3% and 4% of abundance, respectively.

DISCUSSION

Floral characteristics as predictors of maximum pollinator abundance

This study demonstrates floral species richness as a relatively strong predictor of maximum pollinator abundance, suggesting enrichment of urban greenspace with species rich floral resources may augment the abundance of pollinators (Blaauw & Issacs, 2014; Blackmore *et al*., 2014; Nichols *et al*., 2019). However, the effect of floral species richness was weaker than expected and may suggest floral enrichment alone is insufficient to enhance pollinator communities, as demonstrated in Matteson & Langellotto (2011) and Albrecht *et al*. (2020). Therefore, addressing site-specific features such as land management, anthropogenic pollution, patch fragmentation and plant-pollinator phenology is important for effective conservation of pollinators, underpinning the need for greater understanding of factors influencing pollinators across the City of Glasgow (Goulson *et al*., 2002; Reader *et al*., 2005; Holzschuh *et al*., 2007; Wesche *et al*., 2012; Walter & Bartomeus, 2020). Additionally, the unexpected non-significance of floral abundance highlights there may be a point of saturation where additional flowers yield diminishing returns, especially if pollinators are oligolectic (Gerner & Sargent, 2022). Considering the origin of floral resources, whether native or non-native, may also be important. While greater research is required to understand the merits of native and non-native plantings in pollinator conservation strategy, Salisbury *et al.* (2015) demonstrate native and near-native plantings attracted a greater abundance of pollinators compared to non-natives. However, this was subject to species-specific morphology such as tongue length as well as temporal dynamics and phenology, with greater interactions with the non-native treatment later in the season during peak bloom.

Site as a predictor of maximum pollinator abundance and variance at the transect-scale

Considering the substantial variance in pollinator abundance captured at the transect-scale (Table 2), the broader classification of site may introduce bias in our understanding of drivers of plant-pollinator interactions highlighted at this finer resolution. At this level, differences in factors such as floral characteristics, microhabitat opportunities, microclimate and small-scale differences in urban drivers of plant-pollinator interaction may play a crucial role in influencing pollinator abundance. This may suggest conservation efforts should be targeted at these finer resolutions rather than a broader approach based on site to effectively support pollinators in Glasgow. However, the effect of each site on pollinator abundance provides interesting results. Pollinator abundance was similar, although on average reduced, in Trinley Brae, Kelvingrove Park, Yorkhill Park and Knightswood Park relative to Botanic Gardens, but these differences were not significant. The effect of Trinley Brae was only marginally above the significance threshold, likely due to the impact of substantially greater floral abundance (Tables 2 and 3). Victoria Park was highlighted as the only site with significantly fewer pollinators relative to Botanic Gardens. While the analysis provides valuable insights, it is important to consider site-specific features that may impact pollinator abundance in the six public parks.

Site	Mean	Std. dev
Trinley Brae	67.1	30.0
Victoria Park	22.4	27.0
Botanic Gardens	18.4	10.1
Knightswood Park	14.0	5.50
Yorkhill Park	11.0	6.10
Kelvingrove Park	8.30	4.90

Table 3. Mean ± SD floral abundance/quadrat (n = 20 in all sites). Arranged in order of decreasing floral abundance.

Botanic Gardens and Kelvingrove Park

Botanic Gardens is a heterogenous urban greenspace rich in ecosystem complexity, with a diverse assemblage of native and non-native plantings providing a variety of foraging resources and pollinator habitats. Pollinator abundance was greatest in Botanic Gardens suggesting high quality conditions (Tables 2 and 4). Kelvingrove Park was second to Botanic Gardens (only marginally above Trinley Brae) as greatest in pollinator abundance, with relatively high floral characteristics, offering a range of woodland, grassland and riparian habitat opportunities. Botanic Gardens and Kelvingrove Park are separated by approximately 2 km and bordered by the River Kelvin, providing an important ecological corridor between these sites, as well as urban and peri-urban Glasgow (Scott, 2018). It was also noted that the Kirklee Allotment is situated along this corridor 500 m upstream from Botanic Gardens. Allotments have been shown to be pollinator conservation hotspots in urban landscapes, providing diverse nutrition and heterogenous habitat opportunities to support functionally diverse pollinators while serving as important source habitats (Baldock *et al*., 2019; Andersson *et al*., 2007; Griffiths-Lee *et al*., 2022).

Assuming adequate provision of forage and resting sites, the River Kelvin corridor may support dispersal of pollinators between the Kirklee Allotment, Botanic Gardens and possibly into Kelvingrove Park. The distance between Botanic Gardens and Kelvingrove Park likely inhibits movement of most solitary insect pollinators (Gathmann & Tschartke, 2002) but larger-bodied eusocial individuals may forage throughout the wider meta-ecosystem (Chapman *et al*., 2003).

Site	Mean	Std. dev
Botanic Gardens	7.75	3.56
Kelvingrove Park	6.55	3.56
Trinley Brae	6.55	3.23
Yorkhill Park	6.10	2.57
Knightswood Park	5.60	2.56
Victoria Park	3.75	1.71

Table 4. Mean ± SD maximum pollinator abundance/quadrat (n = 20 in all sites). Arranged in order of decreasing pollinator abundance.

Pollinators foraging between these sites may support metapopulation dynamics, mitigate habitat fragmentation pressures, enhance pollen transfer and gene flow, supporting observations between sites. Overall, pollinator abundance and floral characteristics in Botanic Gardens and Kelvingrove Park, as well as surrounding landscape features, demonstrates the ecological value of heterogenous habitat, diverse forage resources and possibly the role of allotments and functional landscape connectivity in pollinator conservation strategy (Staddon *et al.*, 2010; Haddad *et al.*, 2015; Townsend & Levey, 2005; Van Geert *et al.*, 2010; Baldock *et al.*, 2019; Kwak *et al.*, 1998). Future research should therefore test for functional landscape connectivity in patches along the River Kelvin corridor, potentially using model organisms and genetic testing techniques to assess gene flow in pollinator populations between sites.

Trinley Brae and Knightswood Park

Trinley Brae and Knightswood Park are approximately 400 m apart, separated by rows of urban dwellings with gardens that may serve as ecological stepping stones and by Glasgow's Great Western Road. While some larger-bodied pollinators may disperse between sites, roads present significant barriers for dispersal, particularly for smaller-bodied taxa (Chapman *et al.*, 2003; Fitsch & Vaidya, 2021).

In Knightswood Park, a considerable proportion of pollinators were dipterans, constituting the most homogenous community across the six sites, with implications for ecosystem production and function (Fig. 5) (Oliver *et al.*, 2015). Along with lepidopterans, dipterans may be less efficient pollinators than hymenopterans (Herrera, 1987) showing good agreement with floral characteristics recorded in the site (Fig. 4; Table 3). Knightswood Park consists primarily of intensively managed amenity grassland, with intense mowing regimes that have been shown to negatively correlate with the abundance and diversity of hymenopterans, which is consistent with our observations (Lerman *et al.*, 2018). Aquatic and riparian habitats in Knightswood Park Pond and Garscadden Burn, located to the south and along the west of the site respectively, may support pollinators with aquatic larvae by providing breeding habitats and oviposition sites. This may explain the high abundance of dipterans in Knightswood Park. However, Diptera were the most abundant order across all sites, including Trinley Brae, where no aquatic or riparian habitats are present.

The size of habitat has strong biodiversity feedbacks, but smaller greenspaces can still support viable pollinator populations, contingent upon availability of quality habitat and resources (Wilson & MacArthur, 1967; Aronson *et al.*, 2014; Scheper *et al.*, 2015; Meyer *et al.*, 2009; Zalucki *et al.*, 2002). Despite Trinley Brae's comparatively small area (Table 1) it supports disproportionately high pollinator abundance and the greatest floral characteristics of all sites. During the site visit, it was noted that Trinley Brae shares its eastern border with the Trinley Brae allotment. Pollinators foraging between these sites may support metapopulation dynamics, reducing habitat fragmentation and edge-effect pressures, common in smaller sites. The allotment may also serve as source habitat for some pollinators. It was observed incidentally that pollinator abundance and floral characteristics appeared more dense towards the east of the site and less dense towards the west. However, this study focused exclusively on public parks, without accounting for the effect of different categories of urban greenspaces (allotments, private gardens, brownfield) on pollinator abundance. Future work should therefore establish how different categories of greenspace influence the abundance and functional diversity of pollinators in Glasgow, to better support plant-pollinator community robustness at city-scale.

Victoria Park

Victoria Park was the only site with significantly fewer pollinators relative to Botanic Gardens, despite both sites being similar in area and floral species richness. In contrast to Botanic Gardens, Victoria Park is markedly fragmented within the urban matrix. Due to the lack of landscape connectivity, all resource requirements must be satisfied from within the single site, and habitat patches must be sufficient in area and resource diversity to support pollinators (Lepczyk *et al.*, 2017). A substantial proportion of Victoria Park consists of intensively managed amenity grassland with implications for the abundance and diversity of hymenopterans (Lerman *et al.*, 2018). This is generally consistent with our observations in the site, excluding the northernmost transect in Victoria Park, where a substantial number of hymenopterans were recorded adjacent to *Philadelphus pubescens* (hoary mock orange) (Fig. 5). There are Victorian-style floral displays throughout the site consisting of one or two ornamental flowering plants. While people can enjoy these floral displays, they may provide pollinators monotonous diet opportunities with implications for fitness and productivity (Dance *et al.*, 2017).

There is a city-managed wildflower meadow in the southern border of the site under a shaded canopy and adjacent to a dual carriageway. Solar irradiance is important in plant-pollinator interactions which may influence the utility and attractiveness of the meadow (Kilkenny & Galloway, 2008). Furthermore, research suggests pollutants in vehicle exhaust, such as elevated ozone and nitrous oxides, can be detrimental to plant-

pollinator interactions (Ceulemans *et al*., 2017; Ryalls *et al*., 2022). Enrichment of the meadow with more shade-tolerant plants and effective management may mitigate these impacts to enhance utility of the meadow.

In contrast to findings in Baldock *et al*. (2015), diverse and abundant floral resources in Victoria Park did not appear to buffer the negative effects of urbanisation on pollinators. Interconnected stressors and pressures in this park, such as the biological effects of habitat fragmentation, exposure to pollutants and possibly land management practices, may contribute to the observed lack of pollinators. Future work is therefore required to better understand and quantify these pressures in future analyses, and to a underpin targeted conservation strategy aimed at remedying and supporting pollinator populations in Victoria Park.

Yorkhill Park

Yorkhill Park is situated along the River Kelvin corridor, approximately 1 km downstream from Kelvingrove Park, close to its confluence with the River Clyde. Pollinators, particularly lepidopterans, were surprisingly abundant in Yorkhill Park despite relatively poor floral species richness and floral abundance. Community-led management of the site by Yorkhill Green Spaces (YGS) may support the abundance with regions of wildflower plantings (largely unaccounted for due to randomised sampling) with a variety of pollinator habitats in wooded areas and grassland. It has also been suggested that the urban heat island effect influences pollinators (Merckx *et al*., 2021) but there is no evidence of this in Glasgow (Plant, 2023). Greater research is required to determine what factors are driving the abundance of pollinators, especially lepidopterans, in this site. It should be noted that observed differences in pollinator abundance and assemblages may be due partly to variations in meteorology, timing of site visits, experimental design and the spatial dynamics of pollinators foraging throughout heterogenous urban greenspaces (Karbassioon & Stanley, 2023). Furthermore, capturing pollinators may produce more reliable abundance counts, as, despite protocols, it is possible some pollinators were counted more than once or were missed entirely.

Floral taxa and existing pollinator conservation strategy

Leucanthemum vulgare (oxeye daisy) provides important summer forage and was observed in all sites except Knightswood Park. *Trifolium repens* (white clover), *Ranunculus* spp. (buttercups) and *Bellis perennis* (common daisy) were recorded in all sites, predominately in amenity grassland, and were the only floral resources observed in Knightswood Park. Hymenopterans and lepidopterans were notably attracted to *Achillea ptarmica* (sneezewort) and oxeye daisy in Trinley Brae, and hymenopterans to hoary mock orange in the northern-most transect in Victoria Park. An existing pollinator conservation strategy includes city- or community-led management of wildflower meadows in all sites except Knightswood Park. City-managed meadows consist of native plantings including oxeye daisy, *Lotus corniculatus* (common bird's foot trefoil), *Silene dioica* (red campion) and *Rhinanthus minor* (yellow rattle), the last being a hemi-parasitic angiosperm which feeds on fine roots of grasses, allowing wildflowers to compete for limiting nutrients (Seel & Press, 1996). In Trinley Brae, regions of bare ground are maintained to offer burrowing opportunities to ground-nesting pollinators such as solitary wasps and mining bees. Other invertebrates including *Omocestus viridulus* (common green grasshopper) were observed in the thicket of Trinley Brae and Victoria Park.

Conclusion

This study examined pollinator abundance in public parks throughout Glasgow. Floral species richness was a relatively strong predictor of maximum pollinator abundance, while floral abundance appeared to be less important, and differences in site-specific factors were highlighted. Enhancing urban greenspaces with diverse floral resources may increase the abundance of insect pollinators. High quality resources, proximity to allotments and potential landscape connectivity facilitated by ecological corridors and stepping stone habitat may support the observed abundance of pollinators in Botanic Gardens, Kelvingrove Park and Trinley Brae. Following the difference in pollinator abundance between Botanic Gardens and Victoria Park, further research is required to understand and quantify the site-specific pressures facing pollinators in Victoria Park. This work may focus on the biological effects of habitat fragmentation, exposure to anthropogenic pollutants and other important urban-drivers of plant-pollinator interaction. Achieving a better understanding of site-specific and city-scale factors affecting pollinators in Glasgow is critical to complement floral enrichment in an integrated approach to conservation, and to help sustain pollination services and our urban greenspaces into the future.

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REFERENCES

Albrecht, M., Kleijn, D., Williams, N.M., Tschumi, M., Blaauw, B.R., Bommarco, R. *et al*. (2020). The effectiveness of flower strips and hedgerows on pest control, pollination services and crop yield: a quantitative synthesis. *Ecology Letters* 23, 1488-1498. https://doi.org/10.1111/ele.13576

Andersson, E., Barthel, S. & Ahrné, K. (2007). Measuring social-ecological dynamics behind the generation of ecosystem services. *Ecological*

applications 17, 1267-1278. https://doi.org/10.1890/06-1116.1

Aronson, M.F.J., La Sorte, F.A., Nilon, C.H., Katti, M., Goddard, M.A., Lepczyk, C.A. *et al.* (2014). A global analysis of the impacts of urbanisation on bird and plant diversity reveals key anthropogenic drivers. *Proceedings of the Royal Society B, Biological Sciences* 281, 20133330. https://doi.org/10.1098/rspb.2013.3330

Bairner, S. (2011). *Glasgow's Buzzing: Pollinator Surveys Year 1*. Glasgow City Council and Buglife, Glasgow. https://cdn.buglife.org.uk/2019/07/Glasgows-Buzzing-Pollinator-Year-1-scotland-logo_0.pdf Accessed 1st May 2023.

Bairner, S. (2012). *Glasgow's Buzzing: Pollinator Surveys Year 2*. Glasgow City Council and Buglife, Glasgow. https://cdn.buglife.org.uk/2019/07/Glasgow-Buzzing-pollinator-report-year-2-scotland-logo_0.pdf Accessed 1st May 2023.

Bairner, S. (2013). *Glasgow's Buzzing: Pollinator Surveys Year 3*. Glasgow City Council and Buglife, Glasgow. https://cdn.buglife.org.uk/2019/07/Glasgow-Buzzing-pollinator-report-year-3.-scotland-logo_0.pdf Accessed 1st May 2023.

Baldock, K.C.R., Goddard, M.A., Hicks, D.M., Kunin, W.E., Mitschunas, N., Osgathrope, L.M. *et al.* (2015). Where is the UK's pollinator biodiversity? The importance of urban areas for flower-visiting insects. *Proceedings of the Royal Society B, Biological Sciences* 282, 20142849. https://doi.org/10.1098/rspb.2014.2849

Baldock, K.C.R., Goddard, M.A., Hicks, D.M., Kunin, W.E., Mitschunas, N., Morse, H. *et al.* (2019). A systems approach reveals urban pollinator hotspots ad conservation opportunities. *Nature Ecology & Evolution* 3, 363-373. https://doi.org/10.1038/s41559-018-0769-y

Bates, D., Maechler, M., Bolker, B. & Walker, S. (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software* 67, 1-48. https://doi.org/10.18637/jss.v067.i01

Biesmeijer, J.C., Roberts, S.P.M., Reemer, M., Ohlemüller, R., Edwards, M., Peeters, T. *et al.* (2006). Parallel declines in pollinators and insect-pollinated plants in Britain and the Netherlands. *Science* 313, 351-354. https://doi.org/10.1126/science.1127863

Blaauw, B.R. & Issacs, R. (2014). Flower plantings increase wild bee abundance and the pollination services provided to a pollination-dependent crop. *Journal of Applied Ecology* 51, 890-898. https://doi.org/10.1111/1365-2664.12257

Blackmore, L.M., Goulson, D., Stewart, A. & Bezemer, M. (2014). Evaluating the effectiveness of wildflower seed mixes for boosting floral diversity and bumblebee and hoverfly abundance in urban areas. *Insect Conservation and Diversity* 7, 480-484. https://doi.org/10.1111/icad.12071

Brom, P., Underhill, L.G. & Winter, K. (2022). A review of the opportunities to support pollinator populations in South African cities. *PeerJ* 10, 12788-12788. https://doi.org/10.7717/peerj.12788

Celary, W., Pawel, O., Fijal, J. & Król, W. (2007). The decline of the bumble bees and cuckoo bees (Hymenoptera: Apidae: Bombini) of Western and Central Europe. *Oryx* 41, 79-88. https://doi.org/10.1017/S0030605307001597

Ceulemans, T., Hulsmans, E., Ende, W.V., Honnay, O. & Nascimento, F.S. (2017). Nutrient enrichment is associated with altered nectar and pollen chemical composition in *Succisa pratensis* Moench and increased larval mortality of its pollinator *Bombus terrestris* L. *PloS ONE* 12(4), e0175160. https://doi.org/10.1371/journal.pone.0175160

Chapman, R.E., Wang, J. & Bourke, A.F.G. (2003). Genetic analysis of spatial foraging patterns and resource sharing in bumble bee pollinators. *Molecular Ecology* 12, 2801-2808. https://doi.org/10.1046/j.1365-294X.2003.01957.x

Dance, C., Botías, C. & Goulson, D. (2017). The combined effects of a monotonous diet and exposure to thiamethoxam on the performance of bumblebee micro-colonies. *Ecotoxicology and Environmental Safety* 139, 194-201. https://doi.org/10.1016/j.ecoenv.2017.01.041

Dicks, L.V., Viana, B., Bommarco, R., Brosi, B., del Coro Arizmendi, M., Cunningham, S.A. *et al.* (2016). Ten policies for pollinators. *Science* 354, 975-976. https://doi.org/10.1126/science.aai9226

Fitsch, G. & Vaidya, C. (2021). Roads pose a significant barrier to bee movement, mediated by road size, traffic and bee identity. *Journal of Applied Ecology* 58, 1177-1186. https://doi.org/10.1111/1365-2664.13884

Gathmann, A. & Tscharntke, T. (2002). Foraging ranges of solitary bees. *Journal of Animal Ecology* 71, 757-764. https://doi.org/10.1046/j.1365-2656.2002.00641.x

Gerner, E.E. & Sargent, R.D. (2022). Local plant richness predicts bee abundance and diversity in a study of urban residential yards. *Basic and Applied Ecology* 58, 64-73. https://doi.org/10.1016/j.baae.2021.11.004

Glasgow City Council (2017). ArcGIS map of Glasgow's urban greenspace. https://glasgowgis.maps.arcgis.com/apps/webappviewer/index.html?id=a968a2a7fa514eb1ac66abc571949c2e Accessed 1st May 2023.

Google Earth Pro (2024). https://www.google.com/earth/about/ Accessed 1st May 2023.

Goulson, D., Hughes, W.O.G., Derwent, L.C. & Stout, J.C. (2002). Colony growth of the bumblebee, *Bombus terrestris*, in improved and conventional agricultural and suburban habitats. *Oecologia* 130, 267-273. https://doi.org/10.1007/s004420100803

Goulson, D., Nicholls, E., Botías, C. & Rotheray, E.L. (2015). Bee declines driven by combined stress from parasites, pesticides, and lack of flowers. *Science* 347(6229).

https://doi.org/10.1126/science.1255957
Griffiths-Lee, J., Nicholls, E. & Goulson, D. (2022). Sown mini-meadows increase pollinator diversity in gardens. *Journal of Insect Conservation* 26, 299-314. https://doi.org/10.1007/s10841-022-00387-2
Haddad, N.M., Brudvig, L.A., Clobert, J., Davies, K.F., Gonzalez, A., Holt, R.D. *et al*. (2015). Habitat fragmentation and its lasting impact on Earth's ecosystems. *Science Advances* 1(2): e1500052. https://doi.org/10.1126/sciadv.1500052
Harrison, T. & Winfree, R. (2015). Urban drivers of plant-pollinator interactions. *Functional Ecology* 29, 879-888. https://doi.org/10.1111/1365-2435.12486
Hartig, F. (2022). DHARMa: Residual Diagnostics for Hierarchical (Multi-Level/Mixed) Regression Models, R package version 0.4.6. https://CRAN.R-project.org/package=DHARMa
Hayhow, D.B., Burns, F., Eaton, M.A., Bacon, L., Bingham, C., Brookman, E. *et al.* (2016). *State of Nature 2016: Scotland*. The State of Nature partnership. https://www.bto.org/sites/default/files/publications/state-of-nature-report-2016-scotland.pdf Accessed 1st May 2023.
Herrera, C.M. (1987). Components of Pollinator "quality": comparative analysis of a diverse insect assemblage. *Oikos* 50(1), 79-90. https://doi.org/10.2307/3565403
Hicks, D.M., Ouvrard, P., Baldock, K.C.R., Baude, M., Goddard, M.A., Kunin, W.E. *et al*. (2016). Food for pollinators: quantifying the nectar and pollen resources of urban flower meadows. *PloS ONE* 11(6): e0158117. https://doi.org/10.1371/journal.pone.0158117
Hinners, S.J., Kearns, C.A. & Wessman, C.A. (2012). Role of scale, matric and native habitat in supporting a diverse suburban pollinator assemblage. *Ecological Applications* 22, 1923-1935. https://doi.org/10.1890/11-1590.1
Holzschuh, A., Steffan-Dewenter, I., Kleijn, D. & Tscharntke, T. (2007). Diversity of flower-visiting bees in cereal fields; effects of farming system, landscape composition and regional context. *Journal of Applied Ecology* 44, 41-49. https://doi.org/10.1111/j.1365-2664.2006.01259.x
Karbassioon, A. & Stanley, D.A. (2023). Exploring relationships between time of day and pollinator activity in the context of pesticide use. *Basic and Applied Ecology* 72, 74-81. https://doi.org/10.1016/j.baae.2023.06.001
Kilkenny, F.F. & Galloway, L.F. (2008). Reproductive success in varying light environments: direct and indirect effects of light on plants and pollinators. *Oecologia* 155, 247-255. https://doi.org/10.1007/s00442-007-0903-z
Klein, A.M., Vaissière, B.E., Cane, J.H., Steffan-Dewenter, I., Cunningham, S.A., Kremen, C. *et al.* (2007). Importance of pollinators in changing landscapes for world crops. *Proceedings of the Royal Society B, Biological Sciences* 274, 303-313. https://doi.org/10.1098/rspb.2006.3721
Kwak, N.M., Velterop, O. & Van Andel, J. (1998). Pollen and gene flow in fragmented habitats. *Applied Vegetation Science* 1, 37-54. https://doi.org/10.2307/1479084
Labandeira, C.C. (2002). The history of associations between plants and animals. In: Herrera, C.M. & Pellmyr, O. (Editors). *Plant-animal Interactions: an Evolutionary Approach*, pp.248-261. Blackwell Press, Oxford.
Lepczyk, C.A., Aronson, M.F.J., Evans, K.L., Goddard, M.A., Lerman, S.B. & Maclvor, J.S. (2017). Biodiversity in the city: fundamental questions for understanding the ecology of urban green spaces for biodiversity conservation. *BioScience* 67, 799–807. https://doi.org/10.1093/biosci/bix079
Lerman, S.B., Contosta, A.R., Milam, J. & Bang, C. (2018). To mow or to mow less: lawn moving frequency affects bee abundance and diversity in suburban yards. *Biological Conservation* 221, 160-174. https://doi.org/10.1016/j.biocon.2018.01.025
Li, K., Li, C., Hu, Y., Xiong, Z. & Wang, Y. (2023). Quantitative estimation of the $PM_{2.5}$ removal capacity and influencing factors of urban green infrastructure. *Science of the Total Environment* 867, 161476. https://doi.org/10.1016/j.scitotenv.2023.161476
Lindsay, J. (2021). *Introduction to Pollinators and Their Habitats.* Buglife Scotland. https://cdn.buglife.org.uk/2021/04/Introduction-to-Pollinator-Habitats-FINAL.pdf Accessed 1st May 2023.
Mansor, M., Ghani, N., Harun, N.Z. & Kakariya, K. (2017). Conceptual models of greenspace and health. *Advanced Science Letters* 23, 6326-6330. https://doi.org/10.1166/asl.2017.9262
Matteson, K.C. & Langellotto, G.A. (2011). Small scale additions of native plants fail to increase beneficial insect richness in urban gardens. *Insect Conservation and Diversity* 4, 89-98. https://doi.org/10.1111/j.1752-4598.2010.00103.x
Merckx, A., Nielsen, M.E., Heliölä, J., Kuussaari, M., Pettersson, L.B., Pöyry, J. *et al.* (2021). Urbanization extends flight phenology and leads to local adaption of seasonal plasticity in Lepidoptera. *Proceeding of the National Academy of Sciences* 118(40): e2106006118. https://doi.org/10.1073/pnas.2106006118
Meyer, B., Jauker, F. & Steffan-Dewenter, I. (2009). Contrasting resource-dependent responses of hoverfly richness and density to landscape structure. *Basic and Applied Ecology* 10, 178-186. https://doi.org/10.1016/j.baae.2008.01.001
Newbold, T., Hudson, L.N., Hill, S.L.L., Contu, S., Lysenko, I., Senior, R.A. *et al*. (2015). Global effects of land use on local terrestrial biodiversity. *Nature* 520, 45-50. https://doi.org/10.1038/nature14324
Nichols, R.N., Goulson, D. & Holland, J.M. (2019). The best wildflowers for wild bees. *Journal of Insect Conservation* 23, 819-830. https://doi.org/10.1007/s10841-019-00180-8
Oliver, T.H., Isaac, N.J.B., August, T.A., Woodcock,

B.A., Roy, D.B. & Bullock, J.M. (2015). Declining resilience of ecosystem functions under biodiversity loss. *Nature Communications* 6, 10122-10122. https://doi.org/10.1038/ncomms10122

Ollerton, J., Erenler, H., Edwards, M. & Crockett, R. (2014). Extinctions of aculeate pollinators in Britain and the role of large-scale agricultural changes. *Science* 346, 1360-1362. https://doi.org/10.1126/science.1257259

Ollerton, J., Winfree, R. & Tarrant, S. (2011). How many flowering plants are pollinated by animals? *Oikos* 120, 321-326. https://doi.org/10.1111/j.1600-0706.2010.18644.x

Plant, E. (2023). The impact of urbanisation on body condition and size in *Bombus hypnorum* and *Bombus lucorum* agg. (Hymenoptera: Apidae) in urban (parkland and brownfield) and rural sites in West Scotland. *The Glasgow Naturalist* 28(1), 90-91. https://doi.org/10.37208/tgn28106

Potts, S.G., Imperatriz-Fonseca, V., Ngo, H.T., Aizen, M.A., Biesmeijer, J.C., Breeze, T.D. *et al.* (2016). Safeguarding pollinators and their values to human well-being. *Nature* 540, 220-229. https://doi.org/10.1038/nature20588

R Core Team (2023). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. https://www.R-project.org/ Accessed 1st May 2023.

Reader, T., Macleod, I., Elliott, P.T., Robinson, O.J. & Mania, A. (2005). Inter-order interactions between flower-visiting insects: foraging bees avoid flowers previously visited by hoverflies. *Journal of Insect Behaviour* 18, 51-57. https://doi.org/10.1007/s10905-005-9346-8

Rose, F. & O'Reilly, C. (2006). *The Wildflower Key: How to Identify Wildflowers, Trees and Shrubs in Britain and Ireland*. Frederick Warne, London.

Ryalls, J.M.W., Langford, B., Mullingerm, N.J., Broomfield, L.M., Nemitz, E., Pfrang, C. *et al.* (2022). Anthropogenic air pollutants reduce insect-mediated pollination services. *Environmental Pollution* 297, 118847. https://doi.org/10.1016/j.envpol.2022.118847

Salisbury, A., Armitage, J., Bostock, H., Perry, J., Tatchell, M. & Thompson, K. (2015). Enhancing gardens as habitats for flower-visiting aerial insects (pollinators): should we plant native or exotic species? *Journal of Applied Ecology* 52, 1156-1164. https://doi.org/10.1111/1365-2664.12499

Scheper, J., Bommarco, R., Holzschuh, A., Potts, S.G., Riedinger, V., Roberts, S.P.M. *et al.* (2015). Local and landscape-level floral resources explain effects of wildflower strips on wild bees across four European countries. *Journal of Applied Ecology* 52, 1165-1175. https://doi.org/10.1111/1365-2664.12479

Scott, C. (2018). Glasgow's biodiversity: the importance of the Kelvin corridor. *The Glasgow Naturalist* 26(4), 10-14.

Seel, W.E. & Press, M.C. (1996). Effects of repeated parasitism by *Rhinanthus minor* on the growth and photosynthesis of perennial grass, *Poa alpina*. *New Phytologist* 134, 495-502. https://doi.org/10.1111/j.1469-8137.1996.tb04367.x

Seto, K.C., Güneralp, B., & Hutyra, L.R. (2012). Global forecasts of urban expansion to 2030 and direct impacts on biodiversity and carbon pools. *Proceedings of the National Academy of Sciences* 109, 16083-16088. https://doi.org/10.1073/pnas.1211658109

Staddon, P., Lindo, Z., Crittenden, P.D., Gilbert, F. & Gonzalez, A. (2010). Connectivity, non-random extinction and ecosystem function in experimental metacommunities. *Ecology Letters* 13, 543-552. https://doi.org/10.1111/j.1461-0248.2010.01450.x

Stewart, R.A., Clark, T.J., Shelton, J., Matt, S., Scott, C., White, S.A., & McCafferty, D.J. (2017). Urban grasslands support threatened water voles. *Journal of Urban Ecology* 3(1), 1-7. https://doi.org/10.1093/jue/jux007

The United Nations (2018). Department of Economic and Social Affairs. https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html Accessed 1st May 2023.

Townsend, P.A. & Levey, D.J. (2005). Experimental test of whether habitat corridors affect pollen transfer. *Ecology* 86, 466-475. https://doi.org/10.1890/03-0607

UKCEH (2021). UK pollinator monitoring scheme: FIT counts. https://www.ceh.ac.uk/our-science/projects/uk-pollinator-monitoring-scheme#:~:text=FIT%20Counts%3A%20if%20you%20can,list%20of%2014%20target%20flowers Accessed 1st May 2023.

Van Geert, A., Van Rossum, F. & Triest, L. (2010). Do linear landscape elements in farmland act as biological corridors for pollen dispersal. *Journal of Ecology* 98, 178-187. https://doi.org/10.1111/j.1365-2745.2009.01600.x

Walter, J. & Bartomeus, I. (2020). Dryness, wetness and temporary flooding reduce floral resource of plant communities with adverse consequences for pollinator attraction. *Journal of Ecology* 108, 1453-1464. https://doi.org/10.1111/1365-2745.13364

Weddle, R.B. (2011). The history and current status of the orange ladybird *Halyzia sedecimguttata* (Linnaeus, 1758) in the Clyde area in the UK context (Coleoptera: Coccinellidae). *The Glasgow Naturalist* 25(3), 79-82.

Wenzel, A., Grass, I., Belavadi, V.V. & Tscharntke, T. (2020). How urbanisation is driving pollinator diversity and pollination – a systematic review. *Biological Conservation* 241, 108321. https://doi.org/10.1016/j.biocon.2019.108321

Wesche, K., Krause, B., Culmsee, H. & Leuschner, C. (2012). Fifty years of change in Central European grassland vegetation: large losses in species richness and animal-pollinated plants. *Biological Conservation* 150, 76-85. https://doi.org/10.1016/j.biocon.2012.02.015

Westphal, C., Bommarco, R., Carre, G., Lamborn, E., Morison, N., Petanidou, T. *et al.* (2008). Measuring bee diversity in different European habitats and

biogeographical regions. *Ecological Monographs* 78, 653-671. https://doi.org/10.1890/07-1292.1

Wickham, H., Averick, M., Bryan, J., Chang, W., McGowan, L.D., François, R. *et al.* (2019). Welcome to the tidyverse. *Journal of Open Source Software* 4(43), 1686. https://doi.org/10.21105/joss.01686

Wilson, E.O. & MacArthur R.H. (1967). *The Theory of Island Biogeography*. Princeton University Press, Princeton New Jersey, U.S.A.

Zalucki, M.P., Clarke, A.R. & Malcolm, S.B. (2002). Ecology and behaviour of first instar larval Lepidoptera. *Annual Review of Entomology* 41, 361-393. https://doi.org/10.1146/annurev.ento.47.091201.145220

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In good company: an appreciation of the Scottish naturalist William Baird MD, FLS, FRS (1803-1872)

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ABSTRACT

Born in Berwickshire (Scotland), in his youth William Baird (1803-1872) voyaged first to the West Indies and South America (1823) and then to the Far East, latterly in the employ (for a decade) of the Honourable East India Company as a surgeon (although precisely where he obtained his MD is a moot point) collecting specimens en route. Later he joined the staff of the zoological department of the British Museum (Natural History), spending 30 years there and publishing widely. He has been criticised by some, unfairly and inaccurately I am not alone in contending, for his modest contribution to science. William Stearn's derogatory comments regarding Baird's malacological output are ascribed to ignorance of the true scope of Baird's responsibility for "Mollusca and lower animals" at the British Museum. Charles Darwin's description of Baird as "indolent" provoked this reappraisal of his contribution to science. In seeking to rescue Baird's reputation I examine his life and times, set his contribution within its wider social context, and present a detailed bibliography of his publications.

INTRODUCTION

The 19th century Scottish naturalist William Baird MD, FLS, FRS (born Eccles, Berwickshire, 1803; died London, 1872; Fig. 1) has suffered unfairly at the hands of certain commentators (except Damkaer, 2017)[1] (superscript numbers refer to notes in Appendix 1). Stearn (2002) was scornful of Baird's few publications on molluscs, considering that he had spent 30 years in that section of the Zoology Department of the British Museum in London[1]. The entry in the *Dictionary of National Biography* states he "published little on the group" (Thompson, 2004). It is true that his Cyclophorida volume (Baird, 1850a) is a slim compilation, one that John Edward Gray (1800-1875), writing in its preface, considered "prefatory to a more comprehensive catalogue". But, in stating that "his major contribution was in curation: arranging, mounting, registering and labelling, thus making the collection available for scientific study", Stearn (2002) too readily damned him with faint praise. His curatorial job was very necessary. We know that Sir William Jardine (1800-1874) had called on Baird at the Museum in 1842 and been distressed about the want of adequate labelling of the collections (Jackson & Davis, 2001). That deficiency represented a constant headache.

Fig. 1. William Baird MD, FLS, FRS (1803–1872). Photograph taken whilst Baird was a member of staff at the Zoology Department of the British Museum (Natural History), exact date unknown. (Natural History Museum Archives DF/PH/2/1/1/3. From the Library and Archives collections of the Natural History Museum, London)

A decade later (in 1856), the Superintendent, Richard Owen (1804-1892), still "pushed for a substantial increase in cataloguing the huge volume of specimens that was flowing into London from expeditions and colonies" (Harrison, 1997). Though Baird was never a shell collector (Dance, 1986), he attended assiduously to his conchological curatorial duties (Douglas, 1872; Gunther, 1975) but Stearn's comments convey the impression that Baird did naught else, which is manifestly untrue.

Stearn overlooked the fact that Baird's responsibility was for "molluscs and lower animals" (Gunther, 1975). As Baird's extensive publications (Hardy, 1872b; updated and corrected in Appendix 2) attest, he concentrated on the "lower animals" aspect while J.E.

Gray, and latterly E.A. Smith (1847-1916), concentrated on the molluscs (Davis, 1995; Stearn, 2002). Baird was an authority on worms (Craw, 1933). True, even there he had his faults. No less an authority on worms than W.C. M'Intosh (1838–1931), whilst being scrupulous in acknowledging Baird's pioneering achievements (Gunther, 1977), had gently chided the shortcomings of Baird's (1853a) British Museum catalogue (M'Intosh, 1869). He recognised that Baird had done "little more than emphasize the problems" (Gunther, 1977). Beddard (1895), another worm specialist, was rather more trenchant in his criticism, noting Baird's failure to give due attention to internal details of oligochaetes. Earthworm studies had been neglected (Benham, 1903). His "entomostracan" compilation, though, the first crustacean monograph published by the Ray Society (Baird, 1850b), has been described as monumental by Damkaer (2017). The catch-all term "Entomostraca" referred to the non-malacostracan Crustacea and has no formal validity these days. It is repeated herein in its historical context only.

Baird retained some publishing contact with the Mollusca at the British Museum (Baird, 1850a) as, conversely, did Gray with the worms (Sipuncula; see Rice & Stephen, 1970); and Baird still fielded departmental molluscan queries. Thus, a letter to him from 1850 exists in the Museum's archives from R. Taylor (1781-1858) discussing snails[2]. Another letter exists from him to Sir Charles Lyell (1797-1875), dated 20th June 1856, relating to *Helix tiarella* from Madeira[3]. Sheffield City Archives retain three letters from Baird to Mrs Margaret Gatty (written 12th April 1867, 30th September 1867 and 2nd August 1870), the second of which relates to identification of shells from Tripoli[4]. According to Bridson *et al.* (1980), Baird was also corresponding with John R. le Brockton Tomlin (1864-1955), Britain's last great private shell collector (Tomlin, 1949), with correspondence being lodged in the National Museum of Scotland (NMS) in Edinburgh; but their respective dates make this highly unlikely. The only reference that can be traced to such an unlikely correspondence in the listing of Tomlin correspondence within the NMS archives is to a "W. Baird" entry that had been scored out, with no explanatory note as to why[5]. Obviously, Baird's position within the British Museum entailed extensive correspondence with naturalists but Tomlin was only eight year old when Baird died. We read in Smiles (1887) that Charles Spence Bate (1819-1889) had passed on some Entomostraca collected by the Banff shoemaker and naturalist Thomas Edward (1814-1886) to "Dr Baird of the British Museum, from ... whom I hope you will hear". This correspondence no longer survives.

Charles Darwin (1809-1882), in confidential correspondence with James Dwight Dana (1813-1895), dated 6th December 1853, referred to Baird as "good-natured, but indolent" (Burkhardt & Smith, 1989). In one of his letters to Mrs Gatty (2nd August 1870)[4], Baird alluded to taking a lengthy summer break from London; "I am sorry that owing to my leaving London in a day or two for a six weeks' holiday, I shall be prevented being of use to you in the matter of your frontispiece for the *Waifs & Strays*" (Gatty, 1871). Harrison & Smith (2008) reported that "the usual vacation" at the Museum was a month. Baird, however, was in his late 60s then (though, perhaps, six weeks represented his habit). We know he re-visited Berwickshire extensively (Moore, 2005). George Johnston of Berwick-upon-Tweed referred to him in the preface to the second edition of *History of British Zoophytes*, as "my long tried friend" (Johnston, 1847). Baird made only a very minor contribution (Baird, 1855a) to the meeting of the British Association for the Advancement of Science (BAAS) (held, that year, in Glasgow against a backdrop of the Crimean War). That might not have advanced his reputation in Darwin's eyes either (although Darwin himself contributed an equally slight contribution (Darwin, 1855); and that juxtaposed to Baird's). We know that Darwin, becoming uncharacteristically peripatetic, attended that meeting in person (Burkhardt & Smith, 1989), but it is questionable if Baird did, as he does not seem to have been a BAAS member. However, could he have had a contribution published despite being absent from the meeting?

Darwin was, however, equally uncomplimentary about all English crustaceologists (Burkhardt & Smith, 1989), although his attitude towards Bate, the Swansea dentist and esteemed marine naturalist with an interest in Crustacea (see Bate & Westwood, 1863-68), improved with Bate's maturity and increasing usefulness (Stott, 2003). Darwin's verdict on Baird is, however, unjust (and I am not aware of Baird's view of Darwin). It belies his substantial contribution to our knowledge of the lower Crustacea (notably Baird, 1850b; see also Appendix 2) when such studies were still in their infancy (Damkaer, 2002). In public though, Darwin had noted his indebtedness to Dr Baird (*inter alia*) in "furnishing specimens and information" for his barnacle monograph (Darwin, 1851). Alfred Merle Norman (1831-1918), by contrast, sounded reassuringly fraternal when he stated "neither Dr Baird's figure nor my own do justice to the great beauty of form of this species [the ostracod *Cythereis jonesii*] when in a perfect state" (Norman, 1867). The Rev. Leonard Jenyns (1800-1893), Darwin's lifelong friend, who also corresponded with many of the "north country naturalists", admitted to not being personally acquainted with William Baird; though he acknowledged that his "attainments were of a high order" (Wallace, 2005).

Some later (non carcinological) authors have done Baird other, more minor, disservices in inadvertently disguising his contribution. Dawes (1947) listed his papers carelessly under "Baird, N." while Stephen & Edmonds (1972), Rice (1975) and Cutler (1994) – by inserting a spurious initial into his name and referencing him under "Baird, W.B." – created unnecessary confusion. The spurious "B." also cropped up during his lifetime[6]. This may have been the result of poor proof-reading by Edmonds (Stephen having died by the time their monograph emerged) and misunderstood secondary citation of their reference list by later authors.

BIOGRAPHICAL CONSIDERATIONS

William Baird's life has been the subject of renewed biographical interest in recent years (Damkaer, 2002, 2017; Moore, 2005). He was commemorated by two of his Berwickshire contemporaries promptly after his death (Douglas, 1872; Hardy, 1872a,b). The best way to understand the twists and turns of Baird's research output is to set it against the path of his career. His family circumstances (shared sibling interests) and personal friendships left a life-long legacy (Davis, 1995). In particular, his friendship with Dr George Johnston (1797-1855), the Berwick physician, marine naturalist and founder of the Ray Society, prospered. Jenyns, mentioned above, rated Johnston's influence as a naturalist as second only to Darwin's (Wallace, 2005). Baird still presented papers to the youthful Plinian Society – an Edinburgh University student society founded in 1823 - into the late 1820s (Hardy, 1872b). Baird had attended Edinburgh High School and studied medicine and surgery at Edinburgh University (Damkaer, 2017). He remained a Plinian at least until 1829. He had been a member of the Ray Society since its inception (Egerton, 1844). Regarding its formation (Davis, 1998), Baird had written to Johnston (18th December 1843) noting:

"I am sorry to say there is such a deal of petty jealousy amongst some of our great men in London that they think every thing that they are not immediately connected with not worth encouraging. One bright luminary remarked to say today "I suppose this will be published at Berwick – that won't do for us Londoners.""

In a later letter to Johnston (29th January 1844), Baird rather exasperatedly accepted that "when a person does not wish to join a Society or speculation, he is very ingeneous [*sic*] in finding out reasons for not doing so" (Davis, 1998).

Baird attested to his "much-valued" friendship with Johnston in his entomostracan monograph (Baird, 1850b). Craw (1933) inferred that contact between Baird and Johnston took place after their return to the Borders, after completion of their education in Edinburgh. However, it seems to have begun earlier, in boyhood. George Johnston was born in 1797 on a farm in the parish of Simprim (sometimes in the past spelled Simprin; now assimilated into Swinton parish) (Davis, 1996). This is the neighbouring parish to Eccles where William Baird was born and where his father, the Reverend James Baird (?1772-1814), was minister (1797-1805) before finally moving to minister at Swinton (1805-1814) (Morrison, 2004). In 1844, Johnston spoke of William Baird as "a friend of thirty years standing" (Hardy, 1892), which would put their date of first contact as 1814, the year that William's father died and the Baird family moved to Edinburgh (Leishman, 1917). Johnston would have been 17 years old then, and Baird 11. Johnston, however, had not spent all his childhood in Berwickshire. His early years – unspecified – had been spent in Ilderton, near Wooler in Northumberland (Craw, 1933; Davis, 1995). To quote Johnston's own words (Davis, 1995) "he [Baird] served his apprenticeship with me as a junior". Their relationship is alluded to in a Plinian Society communication (Baird, 1829b)[7]. By 1818, after being for a short time in London and later in Belford (Northumberland), Johnston came to Berwick-upon-Tweed. He remained there for the rest of his life, practising so tirelessly (he had only two vacations in 35 years) as a surgeon that he judged it politic actually to hide his proficiency in natural history from his patients[8]. Municipal affairs also took up much of his "spare" time, for Johnston was thrice elected Mayor of Berwick. Although working so relentlessly at his Berwick medical practice, it is pleasing to recall that this modest man of great wit and charm (Davis, 1995) retained, and valued, a sense of fun (Craw, 1933). In Johnston, Baird found indeed a treasured soul mate and role model.

Baird's professional life took him away from the Scottish Borders and Edinburgh. His note on the Portuguese man-of-war (Baird, 1831a) recorded his London address at that time (10th April) as 8 Everett St., Russell Square. After eventually eschewing life as a surgeon (Davis, 1983), initially with the Honourable East India Company (HEIC; during the years 1824-1833) and then latterly in London, he changed tack abruptly to assist William Elford Leach's (1791-1836) protégé, John Edward Gray, in establishing the Department of Zoology in London's British Museum (Gunther, 1975)[9]. The most successful commercial venture of the HEIC, though, was in China (the tea trade) not in India (Keay, 1991). During the period that William worked for "John Company", as the HEIC was called in common parlance, he visited India and China five times, spending nearly six years away from home during the decade 1823-1833. William Baird might have been influenced to go "a-voyaging" by his elder brother, the Rev. John Baird, who had undertaken a lengthy trip in H.M.S. *Favourite* in 1820 to recover his health after a period of overwork. During leisure hours – from tutoring the sloop's midshipmen – John had geologised and botanised at the ports he visited (Leishman, 1917). In 1843, William Baird had been in Utah, then Mexican territory, from whence he had sent "some of the fifty-eight specimens noted in Jardine's museum catalogue", including a bird, to his friend Sir William Jardine (Jackson & Davis, 2001). His contribution to Dieffenbach's Natural History of New Zealand of that year, by contrast, had been minor and at arm's length (Baird, in Dieffenbach, 1843)[10].

By the census date of 1851, William Baird was back in Britain, working as an assistant in the Zoology Department of the British Museum and residing (aged 48) with his wife Mary (aged 40) at 3 Lambton Terrace, Kensington (1861 census also).

WILLIAM BAIRD'S SCIENTIFIC OUTPUT IN CONTEXT

Baird's earliest scientific papers stem from his time in the service of the HEIC and include observations on meteorology – the aurora borealis (Baird, 1834, 1836b) and clouds ("sea trees") (Baird, 1836a) – and on exotic animals. Baird became fascinated by the anatomy and behaviour of a "lemur" (either the slender loris, *Loris*

tardigradus, or the pygmy slow loris, *Nycticebus pygmaeus* – lemurs and lorises had been zoologically separated in Baird's time) found "on the beautiful island of Pulo-penang or Prince of Wales' Island". He kept the animal alive for nine months, noting the "double-decker" [my term] tongue and shape of its faeces (Baird, 1829d,e). A note, added by "P.N."[11], stated that the specimen "died at the beginning of 1828 after Mr Baird left on a second voyage to India".

In the interval between finishing his fifth voyage (6th April 1831) and beginning his sixth (24th April 1832) as sea-going surgeon (voyages, appropriately enough, on board H.C.S. *Berwickshire*), he helped his brothers establish the Berwickshire Naturalists' Club in 1831 (22nd September), a club of which its initiator, George Johnston, became "the life and soul" (Craw, 1933). Three of the Baird brothers (John, Andrew and William), together with Johnston and five others (Robert Embleton, George Henderson, John Manners, Alexander Carr and, slightly later that same year, Thomas Brown) – seven doctors and two ministers – made up the nine charter members of the Club. During his voyages (the second voyage was even accomplished under a Captain Johnston), Baird had sent specimens from India (at least) to Gray at the British Museum and had been introduced to Gray by way of a Johnston letter (24th December 1829) when Baird had wanted to use the Museum's library (Gunther, 1975; Davis, 1995).

Baird began publishing in *Annals and Magazine of Natural History* in 1846, when George Johnston was still involved with its editorship. Sir William Jardine was also one of Baird's friends: in the company of fellow cognoscenti they fished the Lochmaben vendace, *Coregonus albula*, in Dumfriesshire (Baird, 1857), an activity no longer possible, the species being extinct at that location (though now the subject of a conservation project at Scottish refuge sites (Lyle *et al*., 2019)). Baird had published with Jardine's *Magazine of Zoology and Botany* in his early years (Baird, 1837, 1838) and Jardine had supported Baird for his FRS[12]. Although Johnston died in 1855, his *Catalogue of British Non-parasitical Worms*, which was published by the British Museum, did not appear until a decade afterwards (Johnston, 1865). William Baird supplied supplementary material and, with J.E. Gray (who furnished prefatory comments), saw through to fruition this posthumous contribution by his old friend. Maybe Gray experienced some pang of conscience in this, given the history between himself and Johnston concerning Johnston's plans – thwarted by Gray's indolence near 20 years previously – for a collaborative *Mollusca Britannica* volume (Davis, 1995). Had Gray not remembered that Johnston had fulsomely dedicated his (1850) *Introduction to Conchology* to him? Stearn (2002) noted, somewhat disparagingly, that in the Natural History Museum "significant studies of annelids were long delayed". Clearly, by overseeing Johnston's non-parasitic worm contribution through the press as a Museum publication, Baird would have been able to temporarily plaster over this "void" in coverage (though how prominent this service was perceived to have been at the time is unclear). Perhaps Baird the populist understood why, for – bending a Shakespearean sturgeon-roe simile (*Hamlet* ii, 2, 430-435) maybe after William Hazlitt's essay *On criticism* (1822) – he (Baird) had admitted (my italics):
"Worms, in a popular sense, are little, if at all, desirable creatures to contemplate; they are, in fact, *"caviare" to the multitude*, and are to thousands mere objects of disgust and annoyance. Poets and romancers have agreed to render them vile."[13]

George Johnston's wife, Catherine, who furnished illustrations for her husband's works, was clearly one subscriber to this view: "Mrs Johnston has a great dislike to Worms" (Hardy, 1892). Perhaps that inhibited the production of Johnston's work on the group. Baird himself, of course, had published extensively on polychaetes and, to a lesser extent, on oligochaetes and hirudineans (Hardy, 1872b; also Appendix 2), though clearly not significantly enough to satisfy Stearn (were, indeed, Stearn even aware of this fact). It seems Baird could not have won his approval, whatever he had done. This is not to say that Baird never attracted criticism from near contemporaries; Baird's (1869a) new Welsh earthworm, *Megascolex diffringens*, being relegated by Beddard (1895) among *species inquirienda* (species of doubtful identity requiring further investigation).

Although Baird was by no means the discoverer of bioluminescence in the sea, he was amongst the first to identify an entomostracous component to luminosity (Baird, 1829c, 1830, 1831b, 1843a). He established that "this phenomenon is caused by numerous small insects, abounding in the sea, and possessed of a power, commandable by their will, of giving rise to this luminous appearance" (Baird, 1829c). In truth, the list is long of organisms that exhibit bioluminescence, "almost to the extent of asking if there are any planktonic organisms which are not phosphorescent!" (Fraser, 1962). This phenomenon had been known about, and remarked upon, since the time of Pliny (Forbes, 1848). The Romans had been aware of several luminous animals, e.g. jellyfish, *Pholas* spp. (piddocks – boring bivalve molluscs), and Romantic poets and travellers like Lord Byron, Sir Walter Scott and James Montgomery had waxed lyrical about phosphorescence in the 18th and 19th centuries (Harvey, 1957). Indeed, John Vaughan Thompson's (1779-1847) first use of the plankton net can be traced to his having been "provoked to curiosity by the appearance of luminous animals in the sea during his return from the Mascarene Islands in late July, or early August, 1816" (Wheeler, 1968; note also Currie, 1983). Baird's scientific interest coincided, in the early 1830s, with that of the eminent German protozoologist C.G. Ehrenberg (1795-1876), the Professor of Medicine in Berlin, who experimented on luminescence caused by dinoflagellates (*Ceratium* spp., *Peridinium* spp.) (Herdman, 1923). Ehrenberg's work on the Infusoria (an old term for microscopic freshwater organisms) probably would have been known to Baird not least via the paper by Sharpey (1833). Edward Forbes (1848) acknowledged that Baird (*inter alia*) had "published valuable observations on this interesting

subject" but he was rightly unimpressed by the inadequate figure of a medusa supplied by this young apprentice (Baird, 1830).

Baird (1859b, 1861c) also pioneered the use of mud as a transport medium for resting-stage entomostracans. He benefited from its use to examine *Branchipus* spp. (fairy shrimp) material sent on to him by his friend Mr Denny at Leeds[14], who had received it from Edward Atkinson "a gentleman attached as surgeon to the consulate at Jerusalem". This convenient facility has been widely exploited ever since (Smith, 1963), not least by that doyen of carcinologists, G.O. Sars (1837-1927) (see Damkaer, 2017).

Baird was also among the first to take an interest in the use of tusk shells, *Dentalium* spp. (Scaphopoda), as currency (wampum) by "First Nation" Americans (Baird, 1864a), even if his species attribution proved subsequently to be incorrect (Clark, 1963). His interest in the borderline between zoology and ethnology, doubtless sparked by his own voyaging experiences and contacts with oriental societies, had been stimulated earlier in his career. In a communication read to Edinburgh's Plinian Society on 26th May 1829, after returning home from his fourth voyage (third to the Far East), he had explained (Baird, 1829a) that the so-called rice paper of China was, in fact, made from the pith of a rush (Juncaceae). He continued his ethnological considerations, later taking an interest in Africa (Baird, 1854a). The Dawada lakes of the remote Edeyan Ubari (Fezzan) district of Libya were populated until recently by people of the same name; also known rather less charmingly as "worm-eaters". The Dawada's main source of nourishment was a sort of crustacean cake made from the brine shrimp *Artemia salina*, the so-called Fezzan worm, worked into a "stinking caviar" or "delicious mush" depending on your point of view (or, more likely, hunger state)[15]. The brine shrimps in the salt pans of Lymington (Baird, 1850c, 1854a) must have seemed inconsequential by comparison. Fox (1949) pointed to some non-existent "errors" over the section relating to *Apus* in Baird's classic monograph (Baird, 1850b): first, arising from a mistranslation from the Latin, in thinking that the first record of this rarest of British crustaceans (the tadpole shrimp, now known as *Triops cancriformis*) actually referred to London (when Linnaeus had stated "Lund", though this was not, in fact, what Baird had said about that specimen's provenance); second, in thinking that the second record (Montagu's communication to Leach) regarding this critically endangered notostracan in Britain had emanated from Devonshire. Doubtless, Baird would have been thrilled to hear that *T. cancriformis*, until recently thought to be extinct in Scotland, had been recorded again (October 2004) from the Solway coast (Caerlaverock) (Morrell, 2005).

There are also interesting snippets buried in his popular articles. He noted, for instance, that the rapid increase in Victorian *papier-maché* work consumed great quantities of Channel Isles ormer (*Haliotis tuberculata*) shell material, since mother-of-pearl was in demand for its manufacture (Baird, 1855b).

Baird published most of his specialist research output solo but "his" compendia, published in the 1850s and 1860s, were often team efforts (see Appendix 2). After the hungry 1840s, these were inspiring times in Britain, for the aspiring middle class anyway. Victorian confidence ran high. The Society for the Diffusion of Useful Knowledge, established in 1826 (at the instigation of that great Whig radical Lord Brougham, 1778-1868)[16] produced affordable publications like the cheap *Penny Magazine* from 1832 until the Society folded in 1848. The ostentation of the Great Exhibition (1851) had proclaimed the ascendancy of British talent and inventiveness to the world. Victorian naturalists also brimmed with optimism (Merrill, 1989). One can imagine Baird being encouraged to proselytise science (and doubtless also make money) by Britain's "go-getting" atmosphere, where, post-1859, a Smilesian self-help ethos held sway. The popular slogan of early Victorian Britain was "Improvement" (Harrison, 1971). But, as now, Victorian science was not a well-paid profession (Meadows, 2004) and, like Thomas Henry Huxley's, Baird's was no privileged background, though he did leave £3,000 on his death (Thompson, 2004). In his *Dictionary of Natural History* (Baird, 1860a) he explained his philosophy, in the preface, thus: "It is intended, in fact, to serve as a familiar work of reference to Natural History, and to appear in as condensed form as could be done [613 pages!], consistently with the object I have always had in view of combining science and instruction with agreeable reading and amusement."

I can applaud his presumption that people gain amusement from reading dictionaries, and feel less isolated in the world as a result of such reassurance.

One might have thought that Baird realised the pitfalls of spreading himself too thinly after the "curate's-eggy" reception accorded his earlier solo compilation *Cyclopædia* (1858b; see below). That he soldiered on alone to produce the weighty dictionary surely helps rebut any charges of indolence. Perhaps as a result of these experiences, however, he came to see the benefits of collaboration, in contemporaneously publishing on so wide a range of topics as biography, systematics and classification. He subscribed to our modern notion of "outreach" and was adept at "networking". For instance, we discern that noted entomologist and Renaissance man, John Obadiah Westwood (1805-1893), referring to him as "my friend" (Westwood, 1831). The scientific community was smaller in those days and a clubby atmosphere prevailed amongst the intellectual élites on both sides of the Scottish border (Alberti, 2001; Withers & Finnegan, 2003).

Baird would certainly have been stung by the faint praise that his *Cyclopædia of the Natural Sciences* (Baird, 1858b) received from a reviewer (Anonymous, 1858) who described it as "a tolerably successful work" (which, nevertheless, figured in the citation for his Royal Society Fellowship)[12]. The lengthy review (my

insertions in square brackets) included the following snippets:
"Even the zoological articles, however, are hardly so good as we should have expected from a writer of Dr Baird's acknowledged powers… a more serious, and quite unexpected, defect in the zoological portion… *would prevent* even the most laborious student from acquiring any clear idea of zoological classification from its pages [the reviewer was especially critical of the inadequate or incorrect coverage of the systematic position of the echinoderms and marsupials]... trust that should the work come to a second edition, Dr Baird will endeavour to remove all causes of these objections [a second edition was, indeed, produced in 1863]."

This 1858 *Cyclopædia* was distinguished from its predecessors by all entries being listed under scientific (instead of popular) names. A hefty tome, it was not cheap; retailing at 15 shillings (75 pence in present money but worth £80 - £120 at today's value) compared, for instance, with Griffin's edition of Gilbert White's *The Natural history of Selborne* which cost 2s 6d (two shillings and six pence) at that time. It would have been selling in competition, for instance, with the zoological dictionary of that writer and publisher of books of information, Samuel Maunder (1785-1849), whose weighty *Treasury of Natural History* had first appeared a decade earlier (Maunder, 1848). Maunder's dictionary subsequently underwent several posthumous editions through the 1860s and 70s, being revised and supplemented then by the parasitologist Thomas Spencer Cobbold (1828-1886). The *Illustrated Natural History* (Wood, 1853), by that prolific populist writer about the natural world the Reverend John George Wood (1827-1889), was also on the market at the time (Wood, 1890), yet there was sufficient demand for a second edition of Baird's *Cyclopædia* in 1863.

With reference to the critical reviewer's comments on Baird's compendium (noted above), it has to be admitted that, systematically, his volume on "Mollusca and Radiata" for *The Museum of Natural History* series (Volume II, Div. VIII) (Richardson *et al*., 1860) is also chaotically structured. That said, this was two decades before Ernst Haeckel's famous "tree of life" appeared in print (Haeckel 1879). "Tabular views" (Bell *et al*., 1862) represented the prevailing classificatory system. Though a term foreign to modern biologists, this appellation was widely applied and understood at the time (Leach, 1815; White, 1858; Lankester, 1867).

FOR A' THAT, AND A' THAT…

As should by now be appreciated, Baird's natural history interests were catholic: bioluminescence, botany, entomology, meteorology, crustaceans, parasitic worms, polychaetes, oligochaetes, sipunculids, molluscs, biography, behaviour, marine and freshwater biology, and parasitology; all figured in his output. Perhaps he did spread his interests too thinly in places as a result but contributing to such a span of topics was not uncharacteristic of naturalists at the time. Over 100 publications (some quite substantial) spanning a 40-year period (Appendix 2) is a surely respectable output for one working predominantly alone (even if several items were published in duplicate, sometimes even triplicate, mainly because the *Annals and Magazine of Natural History* routinely reported information culled from the *Proceedings of the Zoological Society*). Set against J.E. Gray's prodigious output of 1,162 papers during his 35-year reign as Keeper of Zoology (Allen, 1976; but only 700-800 according to Hardy, 1892)[17], or the 1,600 papers produced by his younger counterpart, the American malacologist William Healey Dall (1845-1927) (Lindberg, 1998), Baird's publication list could be represented as a trifle Lilliputian. But, as even his critics allowed, he did spend much time in curating the collections, which, after all, was what a Museum officer's job description – memorable for the absence of the word "research" (Harrison & Smith, 2008) – actually required.

Appropriately, William Baird's name has achieved a deserved permanency in systematics, in the nomenclature of a range of both Recent and fossil taxa (see Appendix 3), even though, unlike his polymath friend George Busk (1807-1886), he never published on any palaeontological topic (unsurprisingly, for worms and copepods do not fossilise like ostracods)[18].

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REFERENCES

(References authored or co-authored by Baird are in Appendix 2.)

Alberti, S.J.M.M. (2001). Amateurs and professionals in one county: biology and natural history in late Victorian Yorkshire. *Journal of the History of Biology* 34, 115-147. https://doi.org/10.1023/A:1010373912743

Allen, D.E. (1976). *The Naturalist in Britain: a Social History*. Allen Lane, London.

Anonymous [Chambers, R.] (1844). *Vestiges of the Natural History of Creation*. Routledge, London.

Anonymous (1858). Bibliographic notice: a cyclopaedia of the natural sciences by William Baird M.D., F.R.S. *Annals and Magazine of Natural History (Series 3)* 1, 438-440. https://doi.org/10.1080/00222935808696955

Bate, C.S. & Westwood, J.O. (1863-68). *A History of British Sessile-eyed Crustacea*. J. Van Voorst, London. https://doi.org/10.5962/bhl.title.1936

Beddard, F.E. (1895). *A Monograph of the Order of Oligochaeta*. Clarendon Press, Oxford. https://doi.org/10.5962/bhl.title.28557

Benham, W.B. (1903). Note on a neglected Tasmanian earthworm. *Report of the Australasian Association for the Advancement of Science* 9, 383.

Bridson, G.D.R., Phillips, V.C. & Harvey, A.P. (1980). *Natural History Manuscript Resources in the British Isles*. Mansell, London.

Brougham, H. (1827). *A Discourse on the Objects, Advantages, and Pleasures of Science*. Baldwin & Cradock, London.

Burkhardt, F. & Smith, S. (Editors) (1989). *The Correspondence of Charles Darwin. Vol. 5. 1851-1855*. Cambridge University Press, Cambridge.

Clark, R.B. (1963). The economics of *Dentalium*. *The Veliger* 6, 9-19.

Craw, J.H. (1933). Centenary volume, with index Volumes I to XXVII. *History of the Berwickshire Naturalists' Club*.

Currie, R.I. (1983). Marine science. *Proceedings of the Royal Society of Edinburgh* 84B, 231-250. https://doi.org/10.1017/S0269727000013816

Cutler, E.B. (1994). *The Sipuncula. Their Systematics, Biology, and Evolution*. Cornell University PreIthaca. https://doi.org/10.7591/9781501723643

Damkaer, D. (2002). *The Copepodologist's Cabinet: a Biographical and Bibliographical History. Vol. 1*. American Philosophical Society, Philadelphia.

Damkaer, D. (2017). *The Copepodologist's Cabinet: a Biographical and Bibliographical History. Vol. 2*. World Association of Copepodologists, Washington DC.

Dance, P. (1986). *A History of Shell Collecting*. E.J. Brill, Leiden. https://doi.org/10.1163/9789004631441

Darwin, C. (1851). *A Monograph on the Sub-class Cirripedia with Figures of All the Species. Vol. 1. The Lepadidae; or, Pedunculated Cirripedes*. Ray Society, London. https://doi.org/10.5962/bhl.title.2104

Darwin, C. (1855). Typical list of Cirripedia for local museums. *Report of the British Association for the Advancement of Science, 25th Meeting, Glasgow* 1855,121.

Davis, P.S. (1983). Marine biologists. In: Lunn, A.G. (Editor). *A History of Naturalists in North East England*, pp. 45-63. University of Newcastle upon Tyne, Newcastle.

Davis, P.S. (1995). George Johnston (1707-1856) of Berwick upon Tweed and the pioneers of marine biology in north-east England. *Archives of Natural History* 22, 349-369. https://doi.org/10.3366/anh.1995.22.3.349

Davis, P.S. (1998). Sir William Jardine's account of the formation of the Ray Society. *Archives of Natural History* 25, 25-58. https://doi.org/10.3366/anh.1998.25.1.25

Dawes, B. (1947). *The Trematoda of British Fishes*. Ray Society, London. https://doi.org/10.5962/bhl.title.7470

Dieffenbach, E. (1843). *Travels in New Zealand; with Contributions to the Geography, Geology, Botany and Natural History of that Country*. John Murray, London. https://doi.org/10.5962/bhl.title.25939

Douglas, F. (1872). Memoir of Dr. William Baird, F.R.S. *History of the Berwickshire Naturalists' Club* 6, 401-404.

Egerton, P. de M.G. (1844). Report of the first annual meeting of the Ray Society, October 2, 1844. Appended to: Link, H.F. (1845). *Report on the Progress of Physiological Botany during the Year 1841* (translated by E. Lankester), pp. 1-24. Ray Society, London.

Forbes, E. (1848). *A Monograph of the Naked-eyed Medusae, with Figures of All the Species*. Ray Society, London. https://doi.org/10.5962/bhl.title.10032

Fox, H.M. (1949). On *Apus*: its rediscovery in Britain, nomenclature and habits. *Proceedings of the Zoological Society of London* 119, 693-702. https://doi.org/10.1111/j.1096-3642.1949.tb00897.x

Fraser, J. (1962). *Nature Adrift. The Story of Marine Plankton*. G.T. Foulis, London. https://doi.org/10.5962/bhl.title.10199

Gatty, A. (1871). *Waifs and Strays of Natural History*. George Bell, London.

Gunther, A.E. (1975). *A Century of Zoology at the British Museum through the Lives of Two Keepers 1815-1914*. Dawsons, Folkestone.

Gunther, A.E. (1977). *The Life of William Carmichael M'Intosh, M.D., F.R.S. of St. Andrews 1838-1931. A Pioneer in Marine Biology*. Scottish Academic Press, Edinburgh.

Haeckel, E.H.P.A. (1879). *The Evolution of Man: A Popular Exposition of The Principal Points of*

Human Ontogeny and Phylogeny. Kegan Paul, Trench & Co., London. https://doi.org/10.5962/bhl.title.57740

Hardy, J. (1872a). Obituary notices: Dr. William Baird, Rev. T. Knight, Dr. Henry Fawcus, T.C. Jerdon, Wm. Grey. *History of the Berwickshire Naturalists' Club* 6, 316-318.

Hardy, J. (1872b). Bibliographical list of the writings of William Baird, M.D., F.R.S., F.L.S. *History of the Berwickshire Naturalists' Club* 6, 404-409.

Hardy, J. (Editor) (1892). *Selections from the Correspondence of Dr George Johnston, Collected and Arranged by his Daughter Mrs Barwell-Carter*. David Douglas, Edinburgh.

Harrison, A.J. (1997). *Savant of the Australian Seas: William Saville-Kent (1845-1908) and Australian Fisheries*. Tasmanian Historical Research Association, Hobart.

Harrison, J.F.C. (1971). *The Early Victorians, 1832-51*. Weidenfeld & Nicolson, London.

Harrison, K. & Smith, E. (2008). *Rifle-green by Nature. A Regency Naturalist and his Family, William Elford Leach*. Ray Society, London.

Harvey, E.N. (1957). A history of luminescence, from the earliest times until 1900. *Memoirs of the American Philosophical Society, Philadelphia* 44, 1-692. https://doi.org/10.5962/bhl.title.14249

Hazlitt, W. (1822). *Table-talk, or Original Essays. Vol. 2*. John Warren, London.

Herdman, W.A. (1923). *Founders of Oceanography and their Work*. Edward Arnold, London.

Jackson, C.E. & Davis, P. (2001). *Sir William Jardine: a Life in Natural History*. Leicester University Press, Leicester.

Johnston, G. (1847). *A History of the British Zoophytes*. John Van Voorst, London. https://doi.org/10.5962/bhl.title.19627

Johnston, G. (1850). *An Introduction to Conchology or, Elements of the Natural History of Molluscous Animals*. John Van Voorst, London. https://doi.org/10.5962/bhl.title.30895

Johnston, G. (1865). *A Catalogue of the British Non-parasitical Worms in the Collection of the British Museum*. British Museum, London.

Keay, J. (1991). *The Honourable Company. A History of the English East India Company*. Harper Collins, London.

Lankester, E. (1867). On the planariæ of our ponds and streams. *The Popular Science Review* 6, 388-400.

Leach, W.E. (1815). A tabular view of the external characters of four classes of animals, which Linné arranged under Insecta; with the distribution of the genera composing three of these classes into orders, &c. and descriptions of several new genera and species. *Transactions of the Linnean Society of London* 11, 306-400. https://doi.org/10.1111/j.1096-3642.1813.tb00065.x

Leishman, J.F. (1917). John Baird of Yetholm, A.D. 1799-1861. *History of the Berwickshire Naturalists' Club* 23, 379-385.

Lindberg, D.R. (1998). William Healey Dall: a neo-Lamarckian view of molluscan evolution. *The Veliger* 41, 227-238.

Lyell, K.M. (Editor) (1881). *Life, Letters and Journals of Sir Charles Lyell. Vol 1*. John Murray, London.

Lyle, A.A., Bean, C.W., Honkanen, H.M., Koene, J.P. & Adams, C.E. (2019). The establishment of Scotland's rarest fish, the vendace (*Coregonus albula*) in conservation refugia sites. *The Glasgow Naturalist* 27(1), 27-31. https://doi.org/10.37208/tgn27104

Maunder, S. (1848). *The Treasury of Natural History*. Longmans, Green & Co., London.

Meadows, J. (2004). *The Victorian Scientist: the Growth of a Profession*. British Library Board, London.

Merrill, L.L. (1989). *The Romance of Victorian Natural History*. Oxford University Press, Oxford.

M'Intosh, W.C. (1869). On the structure of the British nemerteans, and some new British annelids. *Transactions of the Royal Society of Edinburgh* 25, 305-433. https://doi.org/10.1017/S0080456800035262

Moore, P.G. (2005). Dr Baird and his feminine eponyms: biographical considerations and ostracod nomenclature. *Archives of Natural History* 32, 92-105. https://doi.org/10.3366/anh.2005.32.1.92

Morrell, B. (2005). Centre news. *Wildfowl and Wetlands* 151, 30.

Morrison, R. (2004). *Full of Egotism, being the Diary of the Rev. John Hastie, Minister of Edrom Parish Berwickshire 1797-1822*. Borders Family History Society, Edinburgh.

Norman, A.M. (1867). Reports of deep sea dredging on the coasts of Northumberland and Durham. Crustacea. *Transactions of the Natural History Society of Northumberland and Durham* 1, 12-29.

Rice, M.E. (1975). Survey of the Sipuncula of the coral and beach-rock communities of the Caribbean Sea. In: Rice, M.E. & Todorović, M. (Editors). *Proceedings of the International Symposium on the Biology of the Sipuncula and Echiura, Kotor, 18-25 June 1970. Vol. 1*, pp. 35-49. Institute for Biological Research "Siniša Stanković", Belgrade.

Rice, M.E. & Stephen, A.C. (1970). The type specimens of Sipuncula and Echiura described by J.E. Gray and W. Baird in the collection of the British Museum (Natural History). *Bulletin of the British Museum of Natural History (Zoology)* 20, 47-72.

Sharpey, W. (1833). An account of Professor Ehrenberg's more recent researches on the Infusoria. *Edinburgh New Philosophical Journal* 15, 287-308.

Smiles, S. (1887). *Life of a Scotch Naturalist; Thomas Edward, Associate of the Linnean Society*. John Murray, London.

Smith, J.E. (1963). Herbert Graham Cannon 1897-1963. *Biographical Memoirs of Fellows of the Royal Society* 9, 55-68. https://doi.org/10.1098/rsbm.1963.0003

Stearn, W.T. (2002). *The Natural History Museum at South Kensington*. The Natural History Museum, London.

Stephen, A.C. & Edmonds, S.J. (1972). *The Phyla Sipuncula and Echiura*. British Museum (Natural History), London.

Stott, R. (2003). *Darwin and the Barnacle*. Faber & Faber, London.

Thompson, R.E. (revised Osborne, P.) (2004). Baird, William (1803-1872). In: Matthew, H.C.G. & Harrison, B. (Editors). *The Oxford Dictionary of National Biography. Vol. 3*, p. 352. Oxford University Press, Oxford.

Tomlin, J.R. le B. (1949). Shell sales. VI. *Proceedings of the Malacological Society of London* 27, 254-256.

Wallace, I. (Editor) (2005). *Leonard Jenyns, Darwin's Lifelong Friend*. Bath Royal Literary and Scientific Institution, Bath.

Westwood, J.O. (1831). Additional remarks on the luminosity of the sea. *The Magazine of Natural History, and Journal of Zoology, Botany, Mineralogy, Geology and Meteorology* 4, 505-511.

Wheeler, A. (1968). An introduction to the "Zoological researches of John Vaughan Thompson". In: Thompson, J.V. *Zoological Researches and Illustrations 1828-1834*. Sherborn Fund Facsimile, Number 2, pp. i-vi. Society for the Bibliography of Natural History, London.

White, A. (1858). *Tabular View of the Orders and Leading Families of Insects*. Society for Promoting Christian Knowledge, London.

Withers, C.W.J. & Finnegan, D.A. (2003). Natural history societies, fieldwork and local knowledge in nineteenth-century Scotland: towards a historical geography of civic science. *Cultural Geography* 10, 334-353.
https://doi.org/10.1191/1474474003eu278oa

Wood, J.G. (1853). *The Illustrated Natural History*. Routledge, London.
https://doi.org/10.5962/bhl.title.58664

Wood, T. (1890). *The Rev. J.G. Wood, His Life and Work*. Cassell, London.
https://doi.org/10.5962/bhl.title.17971

APPENDIX 1

Notes

1. William Saville-Kent, who worked under Baird's direction at the British Museum, apparently knew our subject as "Jim" (Harrison, 1997). "Jimmy" remains the universal male Glaswegian salutation, though "Jock" perhaps more typifies the Scot abroad. Note also the odd historical status of Berwick-upon-Tweed as an English town whereas Berwickshire is a county in Scotland.
2. DF250/21 Letter from R. Taylor to W. Baird (Archives; Natural History Museum, London).
3. GB0237 Letter from William Baird to Sir Charles Lyell, dated 20th June 1856 (Gen. 118 Lyell 2/234-236); Navigational Aids for the History of Science, Technology and the Environment (NAHSTE) archive, University of Edinburgh.
4. Three letters from W. Baird to Mrs Margaret Gatty (Sheffield City Archives, Sheffield): 12th April 1867 concerning sponges and ascidians (Sheffield Archives Miscellaneous Documents 2135/1), 30th September 1867 concerning shells (SA: MD 2135/2), 2nd August 1870 concerning Venus's flower basket (SA: MD 2135/3).
5. Sankurie Pye (Library Services, National Museum of Scotland, Edinburgh) to P.G. Moore (hereafter PGM), personal communication, 27th September 2005.
6. Letter to "W.B." Baird, undated, from Dr Robert K. Greville (the famous Edinburgh botanist) concerning the return of some of Dr Johnston's specimens (Smithsonian Institution Archives, J.O. Westwood papers, 1816-1890 Record Unit 7112, box 1 of 3, folder 12 microfilm copy in reel 1 of autograph collection).
7. It is not clear whether that "shared apprenticeship" in Edinburgh referred to by Johnston was at the University's medical school or the town's High School. Baird referred to himself as "Mr" in his first travel journal of 1823 and there is no record of his having a medical degree from Edinburgh (D. Damkaer, unpublished). He was referred to as "Esq." in his "lemur" paper that was communicated to the Plinian Society in May 1827 (Baird, 1829e). His membership entry in the report of the first meeting of the Ray Society (Egerton, 1844) though credits him as "M.D." Some decades earlier, the notable Scottish anatomist/physician brothers Hunter William (1718-1783) and John (1728-1793) Hunter received very little university education and learned their medical craft as apprentices. However, by Baird's time, the University of Edinburgh was highly regarded as providing the foremost medical teaching in the country. Charles Darwin, of course, had studied there for a year.
8. Even the great geologist Sir Charles Lyell, it may be recalled, was so aware of the disrepute with which his hobby (collecting insects) was held that he "followed it up almost by stealth" (Lyell, 1881).
9. It seems appropriate here to place on record a marginal annotation in the second-hand copy of Gunther's indifferently proof-read book (1975) belonging to PGM. Pencilled-in at the top of page 403 by its previous owner (who, subsequent enquiries with the bookseller revealed, was B.J. Clifton, the Entomology librarian at the Museum in the 1950s-1960s), is a revealing comment regarding the recruitment policy at the British Museum: "up to 1939 only Public School people and degrees from Oxford, Cambridge and Edinburgh to be accepted. Can only remember 2 exceptions."
10. German-born Dr J.K. Ernst Dieffenbach (1811-1855) had been a surgeon naturalist with the New Zealand Company. The first trained scientist to live and work in New Zealand, he made important explorations of that country beginning in 1839, returning to England in October 1841. He eventually became supernumerary professor of geology at Giessen, Germany (his birthplace). He corresponded with Charles Darwin. In the preface to volume 1 of his *Travels in New Zealand* (Dieffenbach, 1843), he pays tribute to J.E. Gray for contributing the "Fauna of New Zealand" section of his treatise, along with Adam White (1817-1879) and Edward Doubleday (1810-1849) (Gray's already established assistants). Perhaps as befits a mere newcomer to the Zoology Department then, Baird's name makes but a fleeting appearance in that listing (as "in MSS"), in connexion with *Cypris Novae Zelandiae*. This passing reference, however, was enough to warrant an inclusion in Hardy's bibliography (1872a). Quite what these MSS represented is unclear.
11. Presumably Patrick Neill, FRSE (1776-1851), the "printer, philosopher and naturalist" (Hardy, 1892).
12. EC/1867/01, The Royal Society of London, Sackler archive.
13. The National Marine Biological Library, Plymouth has this in a fragment culled from an article of unknown origin (to them) though known to be by Baird.
14. Henry Denny (1803-1871), entomologist and expert on bird parasites, was curator of the Museum of the Leeds Literary and Philosophical Society.
15. From worldsurface.com, a company that formerly promoted sustainable tourism for backpackers.
16. Brougham was another Edinburghian and a prominent exponent of science communication, notably in the Whiggish *Edinburgh Review* (see also Brougham,1827).
17. John Gray "would be one of the Museum's most influential and active Keepers of Zoology, holding the post for 35 years until his death in 1875" (Harrison & Smith, 2008).
18. It seems sensible to record here that the Sowerby collection in the Library of the Natural History Museum (London) contains two original plates, engraved for Baird by James de Carle Sowerby (1787-1871) for two articles that appeared in *Annals and magazine of Natural History* (Baird, 1846 plate IX, 1848a plate VII) (Sowerby Collection Box 43 C85 and C89 respectively). Unfortunately, there is no correspondence either to, or from, Baird in that collection (C14 Box 38) (Rachel Perkins to PGM, pers. comm., 1st June 2005). Another part of Baird's legacy remains in The Linnean Society of London collections, including several hundred line drawings and tracings of Entomostraca systematically arranged, *ca.* 1840s-50s, done by William Baird (Bridson *et al.*, 1980).

APPENDIX 2

Bibliography of William Baird's contributions to science

The listing published previously by James Hardy (1872a), who was Secretary of the Berwickshire Naturalists' Club from 1871 to 1896 (Davis, 1983), contains several errors and inadequacies, and overlooks several contributions. Hardy's list also included some references under Baird's name that relate to mentions of Baird's work by others. In addition, details of those papers that were "in press" at the time of that compilation (that were published after Baird's death in 1872) are given in full herein. The following have been checked against original sources, with very few exceptions.

Alison, A., Baird, W., Brewster, D., Bryce, J., Burton, J.H., Creasy, E.S. *et al.* (1856). *The British Empire: Historical, Biographical and Geographical. Part 2. Dictionary of British Biography*. Richard Griffin & Co., London and Glasgow.

Baird, W. (year not determined). *Tabular View of Orders and Leading Families of Mammalia.* Edward Stanford, London.

Baird, W. (1829a). On the rice paper of China. *Transactions of the Plinian Society* 1829, 25. (Reprinted in *Edinburgh Journal of Natural and Geographical Sciences* 1, 299)

Baird, W. (1829b). On *Trientalis europœa* from the Cheviots; *Rhodiola rosea*; and *Melampyrum montanum*. *Transactions of the Plinian Society* 1829, 33.

Baird, W. (1829c). On the luminousness of the ocean. *Transactions of the Plinian Society* 1829, 34.

Baird, W. (1829d). Notice of the habits and characters of the *Lemur tardigradus* of Linnæus; Le Loris paresseux, où, le Paresseux de Bengale of Cuvier. *Edinburgh New Philosophical Journal* 3, 195-198.

Baird, W. (1829e). Descriptive notice of a specimen of *Lèmur tardígradus* Lin., *Màkis* Cuv., kept alive for some time at Edinburgh. *The Magazine of Natural History, and Journal of Zoology, Botany, Mineralogy, Geology and Meteorology.* 1, 208-216.

Baird, W. (1829f). Table of a series of observations on solar radiation. *Edinburgh Journal of Natural and Geographical sciences* 1, 173-175.

Baird, W. (1829g). The following observations of solar radiation were made in the Indian Seas by Mr Baird in the year 1828. *Edinburgh Journal of Natural and Geographical Sciences* 1, 176.

Baird, W. (1830). On the luminousness of the sea. *The Magazine of Natural History, and Journal of Zoology, Botany, Mineralogy, Geology and Meteorology* 3, 308-321.

Baird, W. (1831a). The Portuguese man of war. *The Magazine of Natural History, and Journal of Zoology, Botany, Mineralogy, Geology and Meteorology* 4, 475-476.

Baird, W. (1831b). Further remarks on the luminosity of the sea. *The Magazine of Natural History, and Journal of Zoology, Botany, Mineralogy, Geology and Meteorology* 4, 500-505.

Baird, W. (1833). Remarks upon the *Gordius aquaticus* or hair-worm. *History of the Berwickshire Naturalists' Club* 1, 23-26.

Baird, W. (1834). On the aurora borealis. *History of the Berwickshire Naturalists' Club* 1, 46-50.

Baird, W. (1835). List of Entomostraca found in Berwickshire. *History of the Berwickshire Naturalists' Club* 1, 95-100.

Baird, W. (1836a). Remarks on the sea tree. *History of the Berwickshire Naturalists' Club* 1, 115-119.

Baird, W. (1836b). Remarks on the aurora borealis, as it occurred at Berwick on the evenings of Tuesday 17th and Wednesday 18th November, 1835. *History of the Berwickshire Naturalists' Club* 1, 127-131.

Baird, W. (1837). The natural history of the British Entomostraca. *Magazine of Zoology and Botany* 1, 35-41, 309-333, 514-526.

Baird, W. (1838). The natural history of British Entomostraca. *Magazine of Zoology and Botany* 2, 132-144, 400-412. https://doi.org/10.1080/00222933809512287

Baird, W. (1843a). Note on the luminous appearance of the sea, with descriptions of some entomostracous insects by which it is occasioned. *The Zoologist* 1, 55-61.

Baird, W. (1843b). Notes on British Entomostraca. *The Zoologist* 1, 193-197.

Baird, W. (1843c). *Cypris Novae Zelandiae.* In: Dieffenbach, E. *Travels in New Zealand; with Contributions to the Geography, Geology, Botany and Natural History of that Country*. *Vol. 2*, p. 268. John Murray, London.

Baird, W. (1845). Arrangement of the British Entomostraca, with a list of species, particularly noticing those which have as yet been discovered within the bounds of the Club. *History of the Berwickshire Naturalists' Club* 2, 145-158.

Baird, W. (1846). Description of some new genera and species of British Entomostraca. *Annals and Magazine of Natural History (Series 1)* 17, 410-416. https://doi.org/10.1080/037454809495847

Baird, W. (1847a). On a new species of *Pennella* [*Pennella postulosa* Baird]. *Annals and Magazine of Natural History (Series 1)* 19, 280. https://doi.org/10.1080/037454809494552

Baird, W. (1847b). Additions to the list of Entomostraca found within the limits of the Berwickshire Naturalists' Club, with a description of *Caligus Strömii*. *History of the Berwickshire Naturalists' Club* 2, 259-260.

Baird, W. (1847c). On the genera *Nebalia* (Leach), *Chirocephalus* (Prevost) and *Branchipus* (Schæffer). *Report of the British Association for the Advancement of Science Part 2*, 74.

Baird, W. (1847d). Pearls and pearl fisheries. Number 167. *Chambers' Miscellany of Useful and Entertaining Tracts* 19, 1-32.

Baird, W. (1848a). Note on the genus *Cypridina*, M. Edwards; with a description of two new species. *Annals and Magazine of Natural History (Series 2)* 1, 21-25. https://doi.org/10.1080/03745485809494466

Baird, W. (1848b). Description of the *Caligus strömii*. *Annals and Magazine of Natural History (Series 2)* 1, 396-397. https://doi.org/10.1080/03745485809494738
Baird, W. (1849a). Arrangement of the British Entomostraca, with a list of species. *History of the Berwickshire Naturalists' Club* 2, 145-158.
Baird, W. (1849b). Monograph of the Family Limnadiadae, a family of entomostracous Crustacea. *Proceedings of the Zoological Society of London* 17, 84-90.
Baird, W. (1850a). *Nomenclature of Molluscous Animals and Shells in the Collection of the British Museum. Part 1. Cyclophoridae.* British Museum, London.
Baird, W. (1850b). *The Natural History of the British Entomostraca*. Ray Society, London. https://doi.org/10.5962/bhl.title.1807
Baird, W. (1850c). Description of a new crustacean. *Proceedings of the Zoological Society of London* 18, 102.
Baird, W. (1850d). Notice of capture of *Sericomyia borealis* on one of the Cheviot Hills, in August, 1850. *History of the Berwickshire Naturalists' Club* 3, 68-70.
Baird, W. (1850e). Description of several new species of Entomostraca. *Proceedings of the Zoological Society of London* 18, 254-257.
Baird, W. (1852a). Description of several new species of Entomostraca. *Annals and Magazine of Natural History (Series 2)* 10, 56-59.
Baird, W. (1852b). Monograph of the family Apodidae, a family of crustaceans belonging to the Division Entomostraca; with a description of a new species of *Apus*, and two species of Ostracoda belonging to the genus *Cypris*. *Proceedings of the Zoological Society of London* 20, 1-8.
Baird, W. (1852c). Monograph of the Family Branchiopodidae, a family of crustaceans belonging to the Division Entomostraca, with a description of a new genus and species of the family, and two new species belonging to the Family Limnadiadae. *Proceedings of the Zoological Society of London* 20, 18-31.
Baird, W. (1853a). *Catalogue of the Species of Entozoa, or Intestinal Worms, Contained in the Collection of the British Museum*. British Museum, London.
Baird, W. (1853b). Some remarks upon Entozoa, or intestinal worms, with a list of the species at present known as occurring within the bounds of the Club. *History of the Berwickshire Naturalists' Club* 3, 142-153.
Baird, W. (1853c). Descriptions of some new species of Entozoa from the collection of the British Museum. *Proceedings of the Zoological Society of London* 21, 18-25. https://doi.org/10.1111/j.1469-7998.1853.tb07169.x
Baird, W. (1854a). The Lymington brine shrimp, and the Fezzan worm. *Excelsior: Helps to Progress in Religion, Science and Literature* 1, 229-232.
Baird, W. (1854b). Snails; their long lives and revivals. *Excelsior: Helps to Progress in Religion, Science and Literature* 1, 343-346.
Baird, W. (1854c). Description of a new species of *Cypris* (*triangularis*). *Proceedings of the Zoological Society of London* 22, 6. https://doi.org/10.1111/j.1469-7998.1854.tb07218.x
Baird, W. (1854d). Numerous entries. In: Rich, E. (Editor). *Cyclopaedia of Biography: Embracing a Series of Original Memoirs of the Most Distinguished Persons of All Times*. Richard Griffin & Co., London and Glasgow.
Baird, W. (1855a). Typical list of Entomostraca for local museums. *Report of the British Association for the Advancement of Science, 25th meeting, Glasgow* 1855, 120-121.
Baird, W. (1855b). The ormer-shell of the Channel Islands. *Excelsior: Helps to Progress in Religion, Science and Literature* 3, 411-414.
Baird, W. (1855c). Descriptions of some new species of Entozoa from the collection of the British Museum. *Annals and Magazine of Natural History (Series 2)* 15, 69-76.
Baird, W. (1857). Notes on the food of some fresh-water fishes, more particularly the vendace and trout. *Edinburgh New Philosophical Journal (New Series)* 6, 17-24.
Baird, W. (1858a). Description of two new species of Entozoa. *Proceedings of the Zoological Society of London* 26, 224-225. https://doi.org/10.1111/j.1469-7998.1858.tb06366.x
Baird, W. (1858b). *The Student's Natural History: a Cyclopædia of the Natural Sciences, Botany, Conchology, Entomology, Geology, Mineralogy, Palæontology, and Zoology.* Richard Griffin & Co., London and Glasgow. (Second edition, 1863)
Baird, W. (1859a). Description of a new species of *Taenia*. *Proceedings of the Zoological Society of London* 27, 111. (Reprinted *Annals and Magazine of Natural History (Series 3)* 4, 240) https://doi.org/10.1080/00222935908697119
Baird, W. (1859b). Description of several species of entomostracous Crustacea from Jerusalem. *Annals and Magazine of Natural History (Series 3)* 4, 280-283. https://doi.org/10.1080/00222935908697126
Baird, W. (1859c). Description of a rare entozoon from the stomach of the dugong. *Proceedings of the Zoological Society of London* 27, 148-149. (Reprinted *Annals and Magazine of Natural History (Series 3)* 5, 329-331)
Baird, W. (1859d). Description of some new recent Entomostraca from Nagpur, collected by the Rev. S. Hislop. *Proceedings of the Zoological Society of London* 27, 231-234.
Baird, W. (1859e). Description of some new recent Entomostraca. *Annals and Magazine of Natural History (Series 3)* 5, 334-337.
Baird, W. (1859f). Description of a new species of entozoon, *Sclerostoma sipunculiforme*, from the intestines of the elephant. *Proceedings of the Zoological Society of London* 27, 425-427. (Reprinted *Annals and Magazine of Natural History (Series 3)* 5, 494-495)

Baird, W. (1860a). *A Dictionary of Natural History*. Richard Griffin & Co., London and Glasgow.
Baird, W. (1860b). Description of a new species of *Estheria* from Nagpoor, Central India. *Proceedings of the Zoological Society of London* 28, 188. (Reprinted *Annals and Magazine of Natural History (Series 3)* 6, 135)
Baird, W. (1860c). Note upon the genus *Cypridina*, Milne-Edwards, with a description of some new species. *Proceedings of the Zoological Society of London* 28, 199-202.
Baird, W. (1860d). On some new species of *Cypridina*. *Annals and Magazine of Natural History (Series 3)* 6, 139-140.
Baird, W. (1860e). Description of a new entomostracous crustacean, belonging to the Order *Phyllopoda*, from South Australia. *Proceedings of the Zoological Society of London* 28, 392-393. (Reprinted *Annals and Magazine of Natural History (Series 3)* 7, 149-150)
Baird, W. (1860f). Description of two new species of entomostracous crustaceans from India. *Proceedings of the Zoological Society of London* 28, 445-446. (Reprinted *Annals and Magazine of Natural History (Series 3)* 7, 324-325)
Baird, W. (1860g). Description of some new species of intestinal worms (Entozoa) in the collection of the British Museum. *Proceedings of the Zoological Society of London* 28, 446-448. (Reprinted *Annals and Magazine of Natural History (Series 3)* 7, 228-230)
Baird, W. (1861a). Description of a new entomostracan crustacean, belonging to the Order Phyllopoda from South Australia. *Annals and Magazine of Natural History (Series 3)* 7, 149-150.
Baird, W. (1861b). Description of two new species of entomostracous crustaceans from India. *Annals and Magazine of Natural History (Series 3)* 7, 324-325.
Baird, W. (1861c). Description of a new species of *Branchipus* (*B. eximius*) from the Pool of Gihon in Jerusalem. *Annals and Magazine of Natural History (Series 3)* 8, 209-210. https://doi.org/10.1080/00222936108697406
Baird, W. (1861d). Note on the occurrence of *Filaria sanguinaria* in the body of *Galaxias scriba*, a freshwater fish from Australia. *Proceedings of the Zoological Society of London* 29, 207-208. (Reprinted *Annals and Magazine of Natural History (Series 3)* 8, 269-270)
Baird, W. (1861e). Note on the *Lernæa cyclopterina* occurring in the gills of the *Cyclopterinus spinosus*, a fish from Greenland. *Proceedings of the Zoological Society of London* 29, 239-240. (Reprinted *Annals and Magazine of Natural History (Series 3)* 8, 496)
Baird, W. (1861f). Notice of the occurrence of *Sclerostoma equinum* ? in the testicle of the horse. *Proceedings of the Zoological Society of London* 29, 271-272. (Reprinted *Annals and Magazine of Natural History (Series 3)* 8, 502-503)
Baird, W. (1862a). Description of two new species of cestoid worms, belonging to the genus *Taenia*. *Proceedings of the Zoological Society of London* 30, 20-21.
Baird, W. (1862b). Descriptions of some new species of Entozoa. *Proceedings of the Zoological Society of London* 30, 113-115. (Reprinted *Annals and Magazine of Natural History (Series 3)* 10, 314-315)
Baird, W. (1862c). Description of several new species of phyllopodous crustaceans belonging to the genera *Estheria* and *Limnetis*. *Proceedings of the Zoological Society of London* 30, 147-149.
Baird, W. (1862d). Description of some new species of entomostracous Crustacea. *Annals and Magazine of Natural History (Series 3)* 10, 1-6. https://doi.org/10.1080/00222936208681270
Baird, W. (1862e). *A Memoir of the Late John Baird, Minister at Yetholm, Roxburghshire; with an Account of his Labours in Reforming the Gypsy Population in that Parish.* James Nisbet, London.
Baird, W. (1862f). Description of seven new species of phyllopodous crustaceans belonging to the genera *Estheria* and *Limnetis*. *Annals and Magazine of Natural History (Series 3)* 10, 391-393.
Baird, W. (1863a). Description of some new species of shells, collected at Vancouver's Island and in British Columbia by J. K. Lord, Esq., naturalist to the British North-American Boundary Commission in the years 1858-62. *Proceedings of the Zoological Society of London* 31, 66-70.
Baird, W. (1863b). Description of two new species of shells collected by Dr. Lyall, of H.M.S. 'Plumper', at Vancouver Island. *Proceedings of the Zoological Society of London* 31, 71.
Baird, W. (1863c). Descriptions of several new species of worms belonging to the Annelida errantia and A. sedentaria or tubicola of Milne-Edwards. *Proceedings of the Zoological Society of London* 31, 106-110. (Reprinted *Annals and Magazine of Natural History (Series 3)* 13, 96-99)
Baird, W. (1864a). Remarks on a species of shell belonging to the family Dentaliidae; with notes on their use by the natives of Vancouver's Island and British Columbia, by J. K. Lord, F.Z.S. *Proceedings of the Zoological Society of London* 32, 136-138. (Reprinted *Annals and Magazine of Natural History (Series 3)* 14, 452-453)
Baird, W. (1864b). Description of a new species of Annelide belonging to the family Amphinomidae. *Transactions of the Linnean Society of London* 24, 449-450. https://doi.org/10.1111/j.1096-3642.1863.tb00167.x
Baird, W. (1864c). On a new species of British Annelides belonging to the family Chaetopteridae. *Transactions of the Linnean Society of London* 24, 477-481. https://doi.org/10.1111/j.1096-3642.1863.tb00171.x
Baird, W. (1864d). Obituary notice of Dr. Robert Dundas Thomson, F.R.S. etc. *History of the Berwickshire Naturalists' Club* 5, 133-135.
Baird, W. (1865a). Description of a new British Annelide belonging to the Tribe Rapacea of Grube = Annelida errantia of Milne-Edwards. *Journal of the Linnean Society of London (Zoology)* 8, 8-10. https://doi.org/10.1111/j.1096-3642.1864.tb02001.x
Baird, W. (1865b). Description of a new species of entozoon from the intestines of the diamond-snake of Australia (*Morelia spilotes*). *Proceedings of the Zoological Society of London* 33, 58. (Reprinted *Annals and Magazine of Natural History (Series 3)* 16, 52) https://doi.org/10.1111/j.1469-7998.1865.tb02309.x

Baird, W. (1865c). Description of several new species and varieties of tubicolous Annelides (tribe Limivora of Grube) in the collection of the British Museum. *Journal of the Linnean Society of London (Zoology)* 8, 10-22. https://doi.org/10.1111/j.1096-3642.1864.tb02002.x
Baird, W. (1865d). On new tubicolous Annelids in the collection of the British Museum, Part 2. *Journal of the Linnean Society of London (Zoology)* 8, 157-160. https://doi.org/10.1111/j.1096-3642.1865.tb02433.x
Baird, W. (1865e). Description of a new variety of *Lepidonotus cirratus* parasitic in the tube of *Chaetopterus insignis*. *Journal of the Linnean Society of London (Zoology)* 8, 161-162. https://doi.org/10.1111/j.1096-3642.1865.tb02434.x
Baird, W. (1865f). Contributions towards a monograph of the species of Annelides belonging to the *Aphroditacea*, containing a list of the known species, and a description of some new species, contained in the national collection of the British Museum. *Journal of the Linnean Society of London (Zoology)* 8, 172-202. https://doi.org/10.1111/j.1096-3642.1865.tb02438.x
Baird, W. (1865g). Supplement, containing addenda and corrigenda and additional species. In: Johnston, G. *A Catalogue of the British Non-parasitical Worms in the Collection of the British Museum*, pp. 337-350. British, Museum, London.
Baird, W. (1866a). Contributions to a monograph of the Aphroditacea. *Journal of the Linnean Society (Zoology)* 9, 31-38. https://doi.org/10.1111/j.1096-3642.1866.tb00179.x
Baird, W. (1866b). Description of a new species of monœcious worm belonging to the Class Turbellaria and Genus *Serpentaria*. *Proceedings of the Zoological Society of London* 1866, 101-102.
Baird, W. (1866c). Descriptions of two new species of phyllopodous crustaceans. *Proceedings of the Zoological Society of London* 1866, 122-123.
Baird, W. (1867). Our freshwater Entomostraca, shell-insects, or water fleas. In: Lawson, H. (Editor). *The Popular Science Review. Vol. 6*, pp. 42-53. Robert Hardwicke, London.
Baird, W. (1868a). Description of a new species of *Ascaris* found in the stomach of the walrus. *Proceedings of the Zoological Society of London* 1868, 71.
Baird, W. (1868b). Monograph of the species of worms belonging to the Subclass *Gephyrea*; with a notice of such species as are contained in the collection of the British Museum. *Proceedings of the Zoological Society of London* 1868, 76-114.
Baird, W. (1868c). Description of a new species of *Sclerostoma* from the stomach of the African elephant (*Loxodonta africana*). *Proceedings of the Zoological Society of London* 1868, 262-264.
Baird, W. (1869a). Description of a new species of earth-worm (*Megascolex diffringens*) found in North Wales. *Proceedings of the Zoological Society of London* 1869, 40-43. https://doi.org/10.1111/j.1469-7998.1869.tb07288.x
Baird, W. (1869b). Descriptions of some new suctorial Annelides in the collection of the British Museum. *Proceedings of the Zoological Society of London* 1869, 310-318. https://doi.org/10.1111/j.1469-7998.1869.tb07332.x
Baird, W. (1869c). Additional remarks on the *Megascolex diffringens*. *Proceedings of the Zoological Society of London* 1869, 387-389. https://doi.org/10.1111/j.1469-7998.1869.tb07341.x
Baird, W. (1870a). Description of a new genus and species of shells from Wydah, on the West coast of Africa, with some remarks on the genus *Proto* of Defrance. *Proceedings of the Zoological Society of London* 1870, 59-61.
Baird, W. (1870b). Contributions towards a monograph of the species of Annelides belonging to the Amphinomacea, with a list of known species, and a description of several new species (belonging to the group) contained in the national collection of the British Museum. To which is appended a short account of two hitherto nondescript annulose animals of a larval character. *Journal of the Linnean Society of London (Zoology)* 10, 215-250. https://doi.org/10.1111/j.1096-3642.1868.tb02233.x
Baird, W. (1870c). Remarks on several genera of Annelides, belonging to the group Eunicea, with a notice of such species as are contained in the collection of the British Museum, and a description of some others hitherto undescribed. *Journal of the Linnean Society of London (Zoology)* 10, 341-361. https://doi.org/10.1111/j.1096-3642.1869.tb00665.x
Baird, W. (1873a). Descriptions of some new species of *Annelida* and *Gephyrea* in the collection of the British Museum. *Journal of the Linnean Society of London (Zoology)* 11, 94-98. https://doi.org/10.1111/j.1096-3642.1870.tb02010.x
Baird, W. (1873b). Natural history notices: shells. In: Brenchley, J.L. (Editor). *Jottings During the Cruise of* H.M.S. Curaçoa *among the South Sea Islands in 1865*, pp. 431-454. Longmans, Green, & Co., London.
Baird, W. & Adams, H.G. (1867). Notes upon some interesting Chinese shells, with a description of two or three new species of Unionidae, collected at Shanghai by Jones Lamprey, M.D., 67th Regiment, C.M.Z.S. *Proceedings of the Zoological Society of London* 1867, 489-492.
Baird, W. & Lamprey, J. (1867). Note on the "*Spiroptera sanguinolenta*" of Rudolphi, a parasite found in the heart of dogs in China, with an account of the occurrence of these worms at Shanghai by J. Lamprey M.D., 67th Regiment. *Journal of the Linnean Society of London* 9, 296-297. https://doi.org/10.1111/j.1096-3642.1867.tb00202.x
Bell, T., Baird, W. & Lowry, J.W. (1862). *Tabular View of the Orders and Leading Families of Reptilia and Amphibia.* Society for Promoting Christian Knowledge, London. https://doi.org/10.5962/bhl.title.48861
Richardson, J., Dallas, W.S., Cobbold, T.S., Baird, W. & White, A. (1860). *The Museum of Natural History: Being a Popular Account of the Structure, Habits and Classification of the Various Departments of the Animal Kingdom: Quadrupeds, Birds, Reptiles, Fishes, Shells and Insects including the Insects Injurious to Agriculture.* William Mackenzie, Glasgow. https://doi.org/10.5962/bhl.title.27751
White, A. & Baird, W. (1861). *Tabular View of the Orders and Leading Families of Myriapoda, Arachnida, Crustacea, Annelida and Entozoa*. Edward Stanford, London. https://doi.org/10.5962/bhl.title.120118

APPENDIX 3

Taxa (extant and fossil) incorporating the name of William Baird

Nomenclatural changes are included and are based on WoRMS Editorial Board (2024). Subsequent fossil ostracod taxa names below family level – many exist – with derivative "Baird" roots are excluded, as not specifically honorific of the man. *Superfamilial ending traditionally used in the palaeontological literature, but now superseded by -oidea, following Article 29.2 of the current *International Code of Zoological Nomenclature* (International Commission for Zoological Nomenclature 1999); †fossil; [a]whichever of these two species names had priority, both names now lapse under synonymy.

Cnidaria: Hydrozoa
Tima bairdii (Johnston, 1833)

Cnidaria: Anthozoa: Scleractinia
Flabellum bairdi Milne Edwards & Haime, 1848; now *Truncatoflabellum spheniscus* (Dana, 1846).

Cnidaria: Actiniaria
Balanophyllia bairdiana Milne Edwards & Haime, 1848

Annelida: Terebellida
Streblosoma bairdi (Malmgren, 1866)

Crustacea: Ostracoda
Superfamily Bairdiacea* G.O. Sars, 1888; now *nomen oblitum*.
Superfamily Bairdioidea G.O. Sars, 1888
Family Bairdiidae G.O. Sars, 1865
Cypridina bairdii Brady, 1866; now *Cypridinodes bairdii* (Brady, 1866).
†*Cythere bairdiana* Jones, 1849
†*Cythere? bairdioides* Jones & Kirkby, 1879
†*Cytheridea bairdioides* Alexander, 1929
[a]*Loxoconcha bairdi* G.W. Müller, 1912; now *Loxoconcha rhomboidea* (Fischer, 1855).
[a]*Loxoconcha bairdii* G.W. Müller, 1912
†*Mossolovela bairdiaeformis* Yegorov, 1953
†*Philomedes? bairdiana* Jones, Kirkby & Brady, 1874

Crustacea: Copepoda
Lernaeonema bairdii Salter, 1850; now *Lernaeenicus sprattae* (Sowerby, 1806).
Pontella bairdii Lubbock, 1853; now *Labidocera acutifrons* (Dana, 1849-1852).
Pontellina bairdii Lubbock, 1860; now *Labidocera acutifrons* (Dana, 1849-1852).
Harpacticus bairdi G.M. Thomson, 1879

Mollusca: Gastropoda
Placostylus fibratus bairdi (Reeve, 1848)

REFERENCES

International Commission for Zoological Nomenclature (1999). *International Code of Zoological Nomenclature*. (4th edition). International Trust for Zoological Nomenclature, London.

WoRMS Editorial Board (2024). *World Register of Marine Species*. https://www.marinespecies.org Accessed 22nd December 2024.

The Glasgow Naturalist (2025) Volume 28, Part 3, 36-47 https://doi.org/10.37208/tgn28309

Additional records of barnacles (Chelonibiidae, Coronulidae and Lepadidae) from stranded turtles around the British Isles

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ABSTRACT
Additional records of barnacles from turtles in British or Irish waters are presented. These include six turtle barnacle records that had been overlooked in a previous review in 2022 and four new records since 2022. The first records of the barnacles *Chelonibia testudinaria* from a green turtle (*Chelonia mydas*) and of *Platylepas hexastylos* from a Kemp's ridley turtle (*Lepidochelys kempii*) in U.K. waters are discussed. Details are also provided on *Lepas anatifera* and *L. hillii* specimens from a loggerhead turtle (*Caretta caretta*) which stranded on the Isle of Man in January 2016 and notes on new records of *Lepas* spp. from loggerhead turtles in Cornwall and Guernsey in 2022 and 2023. The susceptibility of loggerheads to goose barnacle infestation is discussed, as is the occurrence of Columbus crabs (*Planes minutus*) on loggerhead turtles.

INTRODUCTION
Marine turtles are rather unusual visitors to British seas, with the exception of the leatherback turtle (*Dermochelys coriacea*) which occurs regularly in the summer months. However, hard-shelled turtles are always accidental vagrants, with loggerhead turtles (*Caretta caretta*) being the most frequent, and smaller numbers of Kemp's ridley (*Lepidochelys kempii*) and green turtles (*Chelonia mydas*) also occurring on rare occasions. These latter species are not adapted to our colder waters and are often found in a cold-stunned state. On the other hand, large leatherback turtles can tolerate our cooler waters and intentionally visit the western coasts of Britain and Ireland in the summer to feed on jellyfish. All historical records of turtle sightings and strandings in British and Irish waters are collated in the British and Irish TURTLE Database (Pierpoint & Penrose, 2002) which now holds around 3,000 records from 1748 to 2024. Sightings and stranding of turtles between January 2000 and the end of 2024 showed 835 leatherbacks, 210 loggerheads, 62 Kemp's ridley, 12 green turtles, a single olive ridley (*Lepidochelys olivacea*), and 146 unidentified turtles. An analysis of the long-term records of turtles around the U.K. and Ireland was undertaken by Botterell *et al*. (2020).

Turtles can act as vectors of a variety of exotic epifauna, especially barnacles. Two types of barnacles may occur on turtles: stalked goose barnacles (Lepadoidea) and sessile acorn barnacles (Balanomorpha) (Chan *et al*., 2021a). Many of the barnacles commonly found on turtles have cosmopolitan distributions and good illustrated keys for most barnacle species likely to occur on turtles in the North Atlantic are provided by Monroe & Limpus (1979) and Zullo (1979). In his synopsis of British barnacles, Southward (2008) cites only three balanomorph barnacle species recorded from turtles in British waters. Lepadoidea barnacles of the family Lepadidae attach to almost any floating objects, frequently including marine turtles (O'Reilly *et al*., 2022), and in rare cases have even been found on an estuarine terrapin (Lamont *et al*., 2021) and a trans-oceanic tortoise (Gerlach *et al*., 2006). Most balanomorph barnacles found on turtles are from more specialised chelonophilic barnacle families (Chelonibiidae, Coronulidae) which occur only on turtle hosts (Zardus, 2021).

A tabulation of records of barnacles from turtles found in British and Irish seas was provided in O'Reilly *et al*. (2022), which cited 23 cases of turtles observed hosting barnacles since 1923. These included four balanomorph chelonophilic species and three lepadid goose barnacle species. This paper provides information on additional records of turtle barnacles in British waters that were overlooked in the 2022 review and other cases of turtle barnacles that have occurred since. The note was prompted by PD alerting MOR about an overlooked turtle barnacle record from the Isle of Man in 2016. Further overlooked and new records were found by a re-examination of Brongersma (1972), a renewed search of the TURTLE Database, and annual reports on British and Irish marine turtle strandings and sightings webpages (https://strandings.com/annual-reports/ or www.UKTurtles.online) as well as checking online news articles and turtle records on the British Marine Life Study Society website (https://www.glaucus.org.uk/).

TURTLE BARNACLE RECORDS

Review of previous barnacle records from British or Irish turtles

Although turtle standings in British or Irish waters generate a lot of interest, little attention is paid to their barnacle hitch-hikers, which may go unrecorded, or their presence may be only vaguely mentioned, even in cases of severe infestation. Barnacle specimens are rarely retained, and few marine ecologists are practised in identification of turtle barnacles.

The first turtle recorded with properly identified barnacles from British seas was a loggerhead from Skye in 1923 (Ritchie, 1924a,b) which hosted a barnacle bonanza with both acorn barnacles (57 *Chelonibia caretta*) and goose barnacles (several *Lepas anatifera* and one *Conchoderma virgatum*). Leatherback turtles that are intentional summer migrants to our waters are the most frequent host of exotic acorn barnacles in our seas, with most records being the acorn barnacle *Stomatolepas dermochelys*, a relatively small species which embeds in the skin of its host. There are also single records of the acorn barnacle *Platylepas coriacea,* and the goose barnacle *C. virgatum,* from leatherbacks in Irish waters and the acorn barnacle *Chelonibia testudinaria* from a leatherback in Wales. The goose barnacles *L. anatifera* and *L. hillii* have mostly been found on loggerheads with only a single record of goose barnacles from a Kemp's ridley.

Overlooked records of turtle barnacles from Brongersma (1972)

Brongersma (1972) compiled a detailed compendium of information on over 500 historical records of turtles from marine waters of the western European seaboard, from the Iberian peninsula north to the Scandinavian peninsula, and including Iceland. These records from the 1700s to 1971 included all records from the British Isles and Ireland, along with notes and observations on the turtles. The notes sometimes mentioned attached epibionts, such as barnacles or crabs, or even accompanying pilot fish or remoras. Of the records of turtle barnacles from around the U.K. and Ireland cited by O'Reilly *et al*. (2022), the first nine (between 1923 and 1971) are included in Brongersma's volume. However, four other references by Brongersma to barnacles from U.K./Irish turtles appear to have been overlooked and are summarised here.

The first record is of a "green turtle ... covered in barnacles and seaweed" taken in a drift net in Mount's Bay, Cornwall, in October 1874 (no. T1874/01 in the TURTLE Database). This is the earliest record of any barnacles from a British turtle. However, Brongersma considered this turtle was more likely to have been a loggerhead. Unfortunately, no details on the type of barnacles were given.

In December 1953, a hard-shelled turtle stranded alive at Broad Sands, Paignton, Devon. The turtle (T1953/03 in database) was described as being "closely festooned with barnacles on carapace, plastron and each flipper". The description of "clusters of barnacles on each flipper" some of which were subsequently "washed off" suggests these were goose barnacles. This turtle was cited as a hawksbill (*Eretmochelys imbricata*) by Taylor (1963) but its identity was not confirmed and is unlikely to be correct. Hence this turtle is now categorised as unidentified. There has only ever been a single confirmed record of a hawksbill turtle from the U.K. or Irish waters, caught in a herring net off Cork in 1983 (O'Riordan *et al*., 1984; King & Berrow, 2009).

In September 1960, a leatherback turtle was observed at St. Bride's Bay, Pembrokeshire. The leatherback turtle (T1960/12 in database) was "at first mistaken for an upturned dingy with barnacles on it" but no details on the barnacles are provided.

In August 1966, another turtle, probably a leatherback, was seen in Mount's Bay, Cornwall (T1966/03 in database) and described as "a grey mass with barnacles and other marine hitch-hikers stuck to its back". Brongersma commented that the remark about barnacles and other hitch-hikers on the back did not fit with a leatherback turtle and that the impression of having barnacles (on this 1966 Mount's Bay leatherback and the aforementioned 1960 St. Bride's Bay leatherback) may have been caused by the whitish flecks on the carapace and/or the tubercles of the keels. Hence, some uncertainty remains about these latter two records of "barnacles".

Other overlooked turtle barnacle records

On 13th January 2003, a live green turtle (no. T2003/01) was found on Saline Beach on the west coast of Guernsey, in the Channel Islands. The turtle was rescued by Guernsey Society for Prevention of Cruelty to Animals (GSPCA) and transferred to the Guernsey Aquarium for rehabilitation. The turtle was a good-sized adult with curved carapace length of 75 cm and width of 56 cm. It was photographed by Richard Lord, who noted three large turtle barnacles on its upper carapace (Fig. 1A), and he posted the images on the website of the British Marine Life Study Society (www.glaucus.org.uk). The barnacles on this turtle were not mentioned in the TURTLE Database. From the photographs it can be estimated that the largest barnacle at the front of the carapace was around 3.5 cm in diameter (Fig. 1B). The relatively large dome-shaped barnacle shell with un-ribbed plates is characteristic of genus *Chelonibia*; the broad V-shaped radii points to *C. testudinaria,* similar to specimens figured by Hayashi (2012), Zardus *et al.* (2014) and Boyd *et al*. (2021), although the transverse notching within the radii is barely discernible in the photo of the Guernsey specimen. The Guernsey green turtle was repatriated to the Canary Islands in April 2004, although its actual origin could not be determined by DNA analysis. By this time the barnacles had been removed (Penrose, 2004).

On 23rd January 2016, a loggerhead turtle was found dead at White Strand beach, on the Isle of Man, in the Irish Sea. The turtle (no. T2016/031) was one of three loggerheads that washed up on Manx shores in January 2016, and over 40 turtles that stranded in U.K./Eire

Fig. 1. Green turtle (*Chelonia mydas*), Guernsey, January 2003. Turtle carapace length 75 cm. (A) Oblique dorsal view showing presence of barnacles. (B) Close-up of barnacle (*Chelonibia testudinaria*). Barnacle diameter estimated to be around 3.5 cm. (Photos: R. Lord)

waters over the December-January 2015/16 period. The White Strand turtle was transferred to the Manx museum and subsequently photographed by PD. It was 60 cm in length and heavily infested by goose barnacles on the rear and right-hand side of its carapace (Fig. 2A). The turtle was missing its front right flipper, the appearance of the flipper stump suggesting either a congenital defect or a long since healed injury (Fig. 2B). The images indicate that there were at least 80, and perhaps up to 100, goose barnacles attached, ranging from around 4 to 8 cm in length. The barnacles on this turtle were not mentioned in the TURTLE Database.

Most of the goose barnacles are identifiable from the photographs as *L. anatifera*, due to their smooth shell

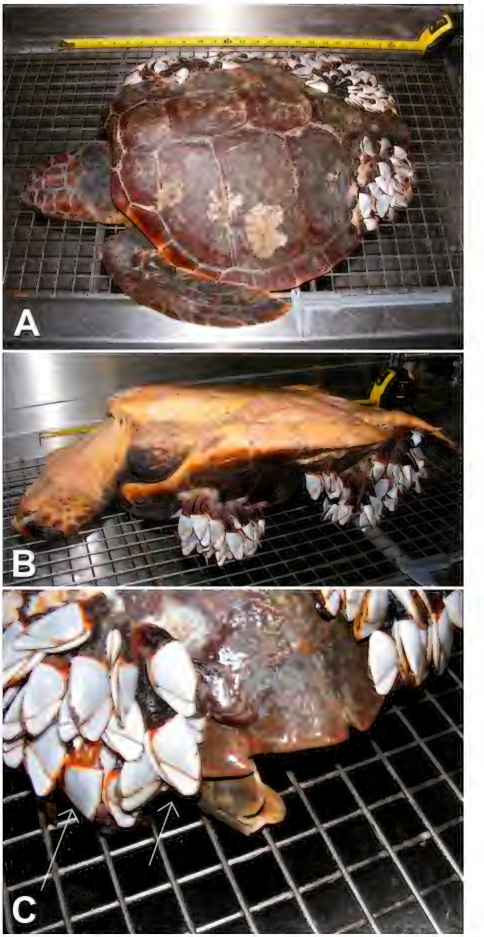

Fig. 2. Loggerhead turtle (*Caretta caretta*) from the Isle of Man, January 2016. Grid squares are 2.5 cm. (A) Dorsal view. (B) Ventral view showing stump of front right flipper. (C) Goose barnacles: *Lepas hillii* (left arrow) and *L. anatifera* (right arrow). (Photos: P. Duncan)

plates (without obvious radial ridges), the narrow gap between the carina and scutum plates, and the absence of any rust-coloured band at the top of the peduncle at its junction with the shelled capitulum (Broch, 1959; Southward, 2008). However, there were a few goose barnacles present with distinct orange collars and a larger fleshy gap between the scutum and carina plates which indicates these were referable to *L. hillii* (Fig. 2C).

A single whole barnacle, 4.5 cm long, was retained and preserved for subsequent examination. Most of the other goose barnacles were composted and the calcareous shell plates were subsequently recovered. The right scutum plates of *L. anatifera* have a distinct inner umbonal tooth at dorsal anterior corner which is absent in *L. hillii* right scutum plates. The anterior edge of the

plate is straight in *L. anatifera* with a robust inner ridge. In *L. hillii* the anterior edge is slightly convex without an obvious inner ridge. The left scutum plates of the two species are not distinguishable. Note that the stalk of goose barnacles is at the anterior end and the aperture through which the cirri protrude is orientated ventrally, the cirri being modified legs. The recovered scutum plates included 56 right plates from *L. anatifera* with the diagnostic inner umbonal tooth, and 29 right plates from *L. hillii* without such a tooth (Fig. 3).

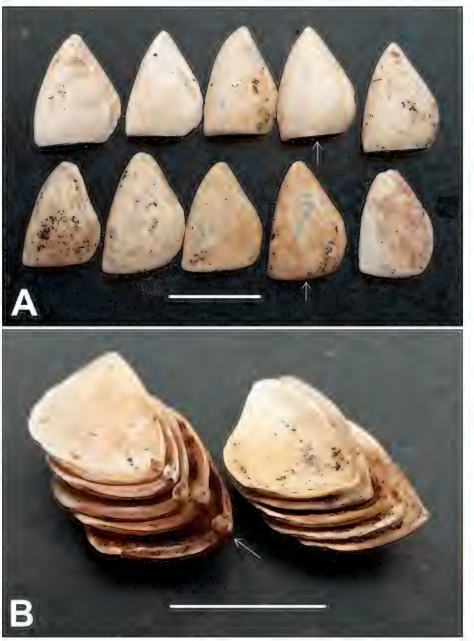

Fig. 3. Scutum plates of *Lepas anatifera* and *L. hillii* from Isle of Man loggerhead turtle, January 2016. Scalebars = 2 cm. (A) Right Scutum plates with anterior edge arrowed: straight in *L. anatifera* (upper row) and slightly curved in *L. hillii* (lower row). (B) Stacks of right scutum plates showing inner umbonal tooth (arrow) and anterior ridge on *L. anatifera* (left stack) and no tooth or ridge on *L. hillii* (right stack). (Photos: M. O'Reilly)

The single preserved goose barnacle was dissected to reveal an inner tooth on the right scutum plate, characteristic of *L. anatifera* as well as the presence of two filamentary appendages adjacent to the oral area, there being three such appendages present in *L. hillii*. The dried shell plates and preserved goose barnacle are deposited in the Manx Museum (Accession numbers: *L. anatifera* 2022-0023/2, *L. hillii* 2022-0023/3). The loggerhead turtle itself was also composted to extract and retain an osteological specimen (Acc. No. 2022-0023/1).

New records of turtle barnacles

On 16th November 2022, a live loggerhead turtle was found stranded by Jude Pearson at Gunwalloe Church Cove, Cornwall. The turtle (no. T2022/12) was a small juvenile with a length only around 20 cm (Cornwall Live, 2022; Penrose & Westfield, 2023). The turtle had at least a dozen large goose barnacles attached to its posterior end (Fig. 4). The turtle was transferred to the Blue Reef Aquarium, Newquay, for rehabilitation where it seems the goose barnacles were removed and discarded. Unfortunately, the turtle died a few weeks later. The post-mortem report by James Barnett suggested the turtle, a male probably less than a year old, was most likely to have died from malnutrition/starvation. Examination of the photo shown in Fig. 4 suggests that both *L. anatifera* and *L. hillii* were present though it is difficult to be certain without closer examination of actual barnacle specimens, which were not retained.

Fig. 4. Juvenile loggerhead turtle (*Caretta caretta*) with goose barnacles, from Gunwalloe Church Cove, Cornwall, November 2022. Turtle length about 20 cm. (Photo: J. Pearson)

On 6th November 2023, following Storm Ciarán, a live loggerhead turtle was found at Chouet beach, Guernsey, Channel Islands, with a mass of goose barnacles attached (ITV, 2023). The turtle was taken into care by Steve Byrne (GSPCA) and transferred to the Guernsey Aquarium for rehabilitation (Byrne, 2024). The turtle (no. T2023/31) was a juvenile with a total length of 30 cm, head to tail, and weight of 800 g net. It carried around 20 large goose barnacles attached to the posterior end, adding another 450 g of weight (Fig. 5).

The barnacles were not examined at the time, but the photographs show a large gap of black flesh between the carina plates and the scutum plates and a hint of an orange collar at base of the capitulum indicating the barnacles were probably *L. hillii*.

Just a few days later, on 10th November 2023, another loggerhead turtle was found at Hayle beach, Cornwall, also with a mass of goose barnacles attached. This turtle (no. T2023/32) was also a juvenile, with a carapace length of 26 cm. A photo taken by Dan Jarvis (British Divers Marine Life Rescue, BDMLR) shows about a dozen *Lepas* sp. goose barnacles attached towards the right side of the posterior end (Fig. 6). The barnacles

Fig. 5. Juvenile loggerhead turtle (*Caretta caretta*) with goose barnacles from Chouet beach, Guernsey, November 2023. Turtle length about 30 cm. (Photo: S. Byrne)

Fig. 6. Juvenile loggerhead turtle (*Caretta caretta*) with goose barnacles from Hayle beach, Cornwall, November 2023. Turtle carapace length 26 cm. (Photo: D. Jarvis)

were not examined at the time and the image is not close enough to allow the barnacle species to be determined. This turtle also harboured a Columbus crab (*Planes minutus*) under its carapace, another exotic turtle hitch-hiker usually known from warmer waters. The Hayle turtle was transferred to the Blue Reef Aquarium for rehabilitation. Both the Guernsey and Hayle loggerheads from 2023 were destined for repatriation to Gran Canaria (Penrose & Westfield, 2024).

Finally, on 23rd December 2024, a Kemp's ridley turtle live stranded on Westward Ho beach in Devon. The turtle (no. T2024/29), a young female 35 cm in overall length, 2.182 kg in weight, and probably around three years old, was transferred to the Blue Reef aquarium for rehabilitation but subsequently died on 8th January 2025. The turtle was subsequently sent for a necropsy (Fig. 7A), which indicated pneumonia as the main cause of death. During the examination, a single barnacle shell was found on the underside on the inframarginal scute on the right side of the plastron (Fig. 7B). The barnacle, an empty shell about 1.5 cm in diameter, was not retained but an identification can be made from two close-up photographs (Fig. 7C,D). The barnacle has a

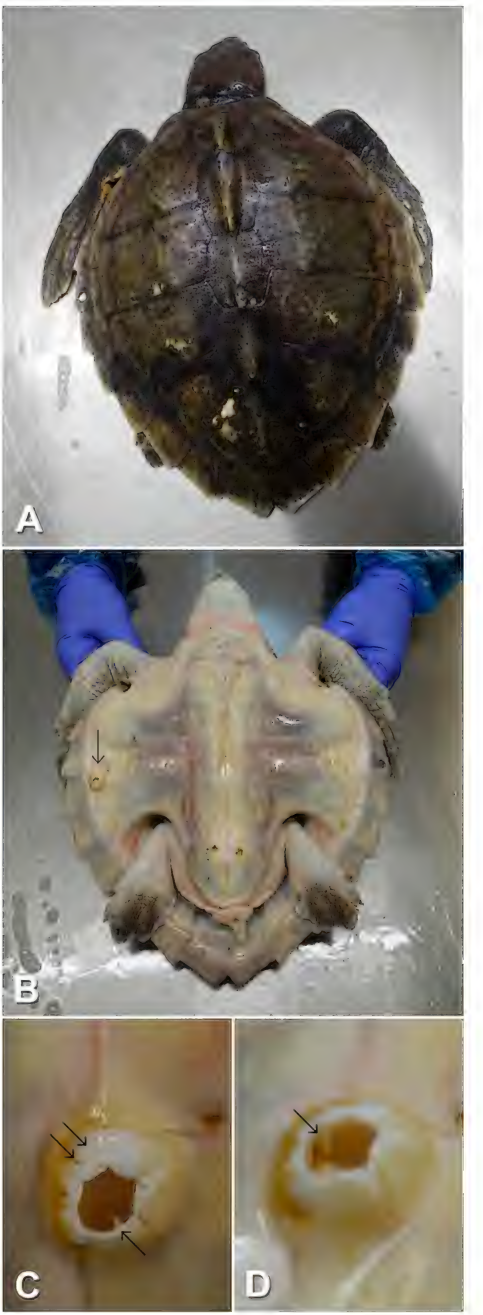

Fig. 7. Juvenile Kemp's ridley turtle (*Lepidochelys kempii*) from Westward Ho, Devon, December 2024. Overall turtle length 35 cm and width 24.6 cm. (A) Dorsal view. (B) Ventral view showing barnacle (arrow). (C,D) Barnacle (*Platylepas hexastylos*) arrowed in B. (C) Close-up view showing striations on left (double arrow) and inner buttress pillar on lower right (single arrow). (D) Oblique view showing internal buttress pillars on upper left (arrow). (Photos: J. Barnett)

flattened-dome-shaped shell with distinctive concentric ridges and striations on the shell plates. Inside the empty shell some buttressing pillars are visible which project downwards and help it clasp onto its host. These features are characteristic of *Platylepas hexastylos* and are nicely illustrated in the study by Lazo-Wasem *et al.* (2011) of epibionts on Mexican turtles.

DISCUSSION

Susceptibility of turtles to goose barnacle infestation

The loggerhead is the most frequent of the shelled turtles that accidentally wander into our waters. Juvenile loggerheads spend several years in the pelagic realm before migrating to neritic waters as adults (Witt *et al.*, 2007). During their juvenile phase in oceanic gyres, young turtles are susceptible to infestation from the goose barnacles attached to accompanying flotsam (Frick *et al.*, 2003). The increase of man-made plastic flotsam in recent decades may possibly increase the prevalence of goose barnacles, potentially exacerbating this problem for turtles (Trewhella & Hatcher, 2015; Barry & Taylor, 2024). Mature loggerheads are less exposed to goose barnacles in coastal waters and are able to carry out self or mutual grooming to remove barnacles (Brongersma, 1972; Frick & McFall, 2007; O'Reilly *et al.,* 2022).

A juvenile loggerhead with a mass of goose barnacles was previously found at Gwithian Beach, Hayle, Cornwall in January 2016 (see Fig. 8 in O'Reilly *et al.* 2022 – note the figure legend citing the host turtle species should read *Caretta caretta,* not *Dermochelys coriacea*). The burden of the barnacles on the juvenile loggerhead from Cornwall in 2016 and the additional juvenile loggerheads mentioned here (Cornwall in November 2022, and Guernsey and Cornwall in November 2023) must have severely impaired their mobility. The juveniles were dragging about half their own body weight in additional barnacles. Another juvenile loggerhead was found on the Dutch coast in December 2023, with around 50 goose barnacles attached posteriorly. These looked like *L. hillii*, although they were mistakenly called "mussels" (Dutch News, 2023). This was one of ten loggerheads that stranded in the Netherlands over the winter of 2023-2024. DNA analysis indicated most of these turtles originated from the Cape Verde Islands, but the one with the goose barnacles came from Florida (De Boer & Goverse, 2024). It would be interesting to compare swimming behaviour and speeds in young turtle specimens with and without barnacles. It seems plausible that such heavy barnacle loads could ultimately cause the demise of such young turtles.

Mature turtles with damaged or missing flippers may also be more susceptible to infestation by goose barnacles. The first recorded case of a turtle covered in barnacles in British waters in 1874 had a severed flipper. Similarly, the loggerheads with severe goose barnacle infestations from Bognor Regis in 1938 and Irvine Bay in December 2015 (see O'Reilly *et al.*, 2022) had missing or deformed front flippers, as had the Isle of Man loggerhead in January 2016. Their compromised swimming ability may have increased the likelihood of goose barnacle settlement and impaired the turtles' ability to undertake grooming activities to remove barnacles. In addition, the cumulative effect of missing or damaged flippers and consequent barnacle load may severely compromise effective and efficient swimming, particularly in colder waters.

Turtles and *Chelonibia* barnacles

The stranding of a green turtle in British waters is a very unusual occurrence itself, let alone its hosting of a turtle barnacle species rarely seen in our seas. The green turtle is rare in European Atlantic seas with only occasional vagrants reaching British or Irish waters. Although the nearest green turtle nesting sites are in the eastern Mediterranean (Arnold *et al.*, 2004), the most likely origin of vagrants to British seas is from the western Atlantic. While juvenile green turtles disperse widely, adults appear to remain closer to their breeding grounds (Monzon-Arguello *et al.*, 2010). It has been suggested that green turtles may be the least cold-water tolerant of the turtles that reach our shores, thus reducing their chance of survival in our seas (Witt *et al.*, 2007).

There are only 17 authenticated green turtle records in the TURTLE Database up until the end of 2024. Green turtle records up until the end of 2011 are discussed by Quigley (2013), including the 2003 Guernsey specimen, but there is no mention of barnacles being present on any of these turtles. Kemp's ridley are frequent vagrants with 94 records in the TURTLE database until the end of 2024. They breed in the western Atlantic with by far the largest rookery being in Mexico (McInerny & Minting, 2016).

However, it seems that even large barnacles such as *Chelonibia* spp. may be overlooked by many biologists examining stranded turtles. Fortunately, Richard Lord thought to post images of the Guernsey green turtle and its barnacles online that were eventually noticed by the present authors, and James Barnett alerted us to the barnacle on the underside of the recent Kemp's Ridley from Devon.

Chelonibia barnacles are usually large (up to 6 cm in basal diameter) and distinctly dome-shaped, and they cement themselves to their host (Monroe & Limpus, 1979; Zardus, 2021). However, they are able to slowly move location on their hosts (Moriarty *et al.*, 2008; Chan *et al.*, 2021b). There are two currently recognised extant species, *C. testudinaria* and *C. caretta*, both widely recorded on various turtles in the Atlantic and Pacific Oceans with *C. testudinaria* known from all seven species of marine turtles (Zullo, 1982; Epibiont Research Cooperative, 2007; Zardus, 2021), as well as from the estuarine diamond-backed terrapin (Davis, 1972). *C. caretta* is restricted to loggerheads, green turtles and hawksbills (Epibiont Research Cooperative, 2007). In the Mediterranean Sea both *Chelonibia* species are known from loggerheads and from green turtles (Fuller *et al.*, 2010; Casale *et al.*, 2012; Hayashi, 2013). *C. testudinaria* is distinguished by its obvious V-shaped radii with shallow transverse notches or pits.

Fully grown *C. testudinaria* are hermaphrodites but the pits within the radii may be settled by small complemental male barnacles (Zardus & Hadfield, 2004). A third species, *C. patula*, which usually attaches to crustaceans, has now been synonymised with *C. testudinaria* (see Bakir *et al.*, 2010; Cheang *et al.*, 2013, Zardus *et al.*, 2014).

There are only two previous records of *Chelonibia* barnacles from turtles in British or Irish waters. The aforementioned loggerhead from Skye in 1923, which hosted nearly 60 *C. caretta,* as well as two species of goose barnacles, and a leatherback (T1993/17) which stranded on the Llŷn (Lleyn) peninsula, North Wales in July 1993 with 15 juvenile *C. testudinaria* attached (Rees & Walker, 1993).

The newly recognised record of *C. testudinaria* from the Guernsey green turtle in 2003 represents the second record of this turtle barnacle in British waters.

The only British record of *C. caretta* is from the Skye loggerhead in 2023, but there is also an even older record of *C. caretta* from just outside of British waters on a loggerhead turtle that stranded in December 1894 on the coast of the Netherlands (Brongersma, 1972). The barnacles collected from its carapace, both *C. caretta* and *P. hexastylos*, were not described until many years later by Holthuis (1952).

***Platylepas* barnacles**

The genus *Platylepas* comprises six extant species of which three are known from sea snakes and three from marine turtles (Zann & Harker, 1978; Hayashi, 2013). Of those from turtles: *P. hexastylos* occurs on all marine turtle species, except the leatherback (and also occurs on sirenians); *P. decorata* only on green, hawksbill, and olive ridley turtles; while *P. coriacea* is restricted to leatherbacks (Monroe & Limpus, 1979; Zardus, 2021). All three of these species are widespread throughout the tropical and subtropical Atlantic and Pacific oceans and *P. hexastylos* has been found on green turtles, loggerheads, and Kemp's ridleys in the western Atlantic (ERC, 2007; Hayashi, 2013). In their study of turtles from Virginia, Lutcavage & Musick (1985) found *C. testudinaria* and *P. hexastylos* to be the most frequent turtle barnacles, occurring on 42% and 17% of 60 loggerheads respectively, while these barnacles were present only infrequently on Kemp's ridleys. In the Mediterranean, *P. hexastylos* has been widely recorded from loggerheads (Casale *et al.*, 2012). One of the earliest illustrations of turtle barnacles, depicted on a hawksbill found in Japanese waters in 1836, has been attributed to *P. hexastylos* by Hayashi (2021).

In British or Irish waters there is only a single record of a *Platylepas* barnacle, recovered from a leatherback which stranded near Dingle, Ireland, in 1978 (O'Riordan, 1979). Although originally referred to *P. hexastylos*, it has since been stated by Zardus (2021) that any *Platylepas* occurring on leatherbacks should be attributed to *P. coriacea* which is exclusive to this species of turtle. The closest previous find of *P. hexastylos* is the very old record mentioned above from the Netherlands loggerhead. The new find of *P. hexastylos* from a Kemp's ridley represents the first record of this species in British waters. Although the barnacle was an empty shell at the time of the necropsy, it was intact and alive when the turtle arrived at the Blue Reef aquarium (Steve Matchett, pers.comm.) and thus can be regarded as a *bona fide* record. The rehabilitation regime for cold-stunned marine turtles includes a preliminary "dry" set up to prevent drowning, followed by a freshwater phase to allow the turtles to rehydrate. Any attached barnacles are likely to die during this process.

Columbus crabs and turtles

The occurrence of the Columbus crab on the loggerhead from Hayle in November 2023 is of interest. Columbus crabs are believed to have been the crabs observed amongst *Sargassum* weed by Christopher Columbus as he neared landfall in the Caribbean in 1492 (Chace, 1951). They occur in warmer waters of the North Atlantic and Mediterranean (Pfaller *et al.*, 2019) but are occasionally found amongst flotsam cast ashore on the southern and western coasts of Britain and Ireland (Trewhella & Hatcher, 2015; BBC, 2015), more rarely as far north as Shetland (Crowthers & Crowthers, 1990). The Columbus crab is habitually found in association with turtles, especially loggerheads, with up to 82% harbouring crabs, which adopt a cleaning role on the turtle, feeding on other epibionts such as barnacle cyprids, or parasitic amphipods (Davenport, 1994; Dellinger *et al.*, 1997). Other crab species may opportunistically attach to turtles, especially if the carapace is damaged and has cracks and holes (Hayashi & Ohtsuchi, 2025).

However, there are few published records of Columbus crabs on turtles from British or Irish seas, perhaps because the adults, being only around two cm in size, could easily be overlooked. In his monograph on British crabs, Ingle (1980) cites an old Cornish record (from Bate, 1878) of *Planes minutus* found "under the tail of a Hawksbill Turtle". However, Brongersma (1972), quoting from the original source, notes that this turtle, while landed alive at Polperro, Cornwall in Spring of 1867, was in fact captured in the channel "at not a great distance from the French coast and therefore is not to be classed as British". The turtle, which Brongersma suggested was more likely to be a loggerhead, harboured two adult Columbus crabs under the shelter of its tail.

The only records of Columbus crabs from turtles in British or Irish waters come from a loggerhead (no. T2009/26) washed up, freshly dead, at Clonakilty, County Cork, Ireland in 2009 (Doyle *et al.*, 2013); and more recently from a loggerhead (no. T2023/12) which live-stranded in February 2023 at Perranporth, Cornwall (TURTLE Database). The new Columbus crab on the Hayle loggerhead in November 2023 represents the third confirmed finding from a turtle in British or Irish waters.

CONCLUDING REMARKS

The additional turtle barnacle records cited here now brings the total number of cases of turtles recorded with barnacles in British or Irish seas to 33 (see Table 1). The first case with properly identified barnacles was the loggerhead from Skye in 1923 with both acorn and goose barnacles. Of the other 32 turtle barnacle cases: 12 are of goose barnacles, with ten cases from loggerheads and one each from a leatherback and a Kemp's ridley; 11 cases are of acorn barnacles on leatherbacks; one acorn barnacle case from a green turtle; one acorn barnacle case from a Kemp's ridley; and seven cases are of unspecified barnacles. The rather sparse number of records of turtle barnacles recorded in our waters, relative to the number of turtles recorded, probably under-represents their actual frequency. Many turtle barnacles are likely to be overlooked, especially some of the smaller barnacle species that embed or bore into the skin and are easily missed. The recovery of barnacle specimens or high-resolution images is usually required to confirm barnacle identifications. Low-resolution images can be ambiguous or misleading: photos of a juvenile Kemp's ridley that live-stranded in December 2017 appeared to have an acorn barnacle on the front rim of the carapace (Cornwall Live, 2017) but closer examination of additional photos from Dave Hudson revealed this was in fact a pale-coloured indented wound and not a barnacle.

Turtle	Location	Date	Barnacles	Source
Loggerhead? (T1874/01)	Mount's Bay, Cornwall, England	Oct. 1874	"covered in barnacles"	Brongersma, 1972
Loggerhead (T1923/02)	Skye, Scotland	Dec. 1923	*Lepas hillii*, *Conchoderma virgatum*, *Chelonibia caretta*	Brongersma, 1972; Ritchie, 1924a, b
Kemp's Ridley (T1938/05)	Jersey, Channel Isles	Dec. 1938	Goose barnacles on shell	Brongersma, 1972
Loggerhead (T1938/09)	Bognor Regis, Sussex, England	Dec. 1938	Goose barnacles attached	Brongersma, 1972
Loggerhead (T1950/02)	Jersey, Channel Isles	Nov.1950	Goose barnacles (turtle upside-down)	Brongersma, 1972
Unidentified (T1953/03)	Torbay, Devon, England	Dec.1953	Goose? barnacles on carapace, plastron and flippers	Brongersma, 1972
Leatherback (T1959/03	Kilbrannan Sound, Firth of Clyde, Scotland	Aug. 1959	Sessile barnacles	Brongersma, 1972; Stephen, 1961
Leatherback? (T1960/12)	St. Bride's Bay, Pembrokeshire, Wales	Sep. 1960	"with barnacles"	Brongersma, 1972
Leatherback? (T1966/03)	Mount's Bay, Cornwall, England	Aug. 1966	"with barnacles"	Brongersma, 1972
Leatherback (T1967/11)	Crail, Fife, Scotland	Nov. 1967	*Stomatolepas dermochelys*	Brongersma, 1972; Smaldon & Lyster, 1976
Loggerhead (T1970/04)	Perranporth, Cornwall, England	Nov. 1970	*Lepas anatifera* on underside	Brongersma, 1972
Leatherback (T1971/03)	High Island, Co. Cork, Ireland	Jul. 1971	*Stomatolepas dermochelys*	Brongersma, 1972; Smaldon & Lyster, 1976; O'Riordan & Holmes, 1978
Leatherback (T1971/05)	Enys Head, The Lizard, Cornwall, England	Jul. 1971	*Stomatolepas dermochelys*	Brongersma, 1972; Smaldon & Lyster, 1976
Leatherback (T1973/04)	Malin Head, Donegal, Ireland	Jul. 1973	*Stomatolepas dermochelys*	O'Riordan & Holmes, 1978
Leatherback (T1975/05)	Stairhaven, Luce Bay, Kirkcudbrightshire, Scotland	Jul. 1975	*Stomatolepas dermochelys*	Smaldon & Lyster, 1976
Leatherback (T1976/03)	Ventry, Kerry, Ireland	Jul. 1976	*Stomatolepas dermochelys*	O'Riordan & Holmes, 1978
Leatherback (T1987/07)	Dingle, Kerry, Ireland	Jul. 1978	*Platylepas coriacea*	O'Riordan, 1979
Leatherback (T1983/08)	Quilty, Clare, Ireland	Jul. 1983	*Conchoderma virgatum*	O'Connor & Bowmer, 1985
Unidentified (T1992/56)	Kowloon Bridge wreck, Cork, Ireland	Jun./Aug. 1992	Barnacles on carapace and head	TURTLE Database
Leatherback (T1993/17)	Lleyn Peninsula, Gwynedd, Wales	Jul. 1993	*Chelonibia testudinaria*	Rees & Walker, 1993
Leatherback	St. Anthony Lighthouse,	Jun. 1997	Back covered in barnacles	TURTLE Database

(T1997/03)	Cornwall, England			
Green Turtle (T2003/01)	Saline Beach, Guernsey, Channel Isles	Jan. 2003	*Chelonibia testudinaria*	www.glaucus.org.uk
Loggerhead (T2006/39)	Pembray, Carmarthenshire, Wales	Dec. 2006	*Lepas anatifera*	Penrose & Gander, 2007
Unidentified (T2008/57)	Wexford, Ireland	Jul. 2008	Barnacles on carapace	TURTLE Database
Loggerhead (T2015/27)	Irvine, North Ayrshire, Scotland	Dec. 2015	*Lepas anatifera*	Brownlow *et al*., 2016; Penrose & Gander, 2016
Loggerhead (T2016/01)	Gwithian Beach, Hayle, Cornwall, England	Jan. 2016	*Lepas hillii*	Penrose & Gander, 2017
Leatherback (T2016/02)	St. Cyrus, Aberdeenshire, Scotland	Jan. 2016	*Stomatolepas dermochelys*	Brownlow *et al*., 2017; Penrose & Gander, 2017
Loggerhead (T2016/031)	White Strand, Isle of Man, Irish Sea	Jan. 2016	*Lepas anatifera*, *Lepas hillii*	This paper
Leatherback (T2018/04)	Marazion, Cornwall, England	Aug. 2018	*Stomatolepas dermochelys*	Wilkinson, 2018; Penrose & Gander, 2019
Loggerhead (T2022/12)	Gunwallow Church Cove, Cornwall, England	Nov. 2022	*Lepas anatifera*, *Lepas hillii*?	Penrose & Westfield, 2023
Loggerhead (T2023/31)	Chouet, Guernsey, Channel Isles	Nov. 2023	*Lepas hillii*?	Byrne, 2024
Loggerhead (T2023/32)	Hayle, Cornwall, England	Nov. 2023	*Lepas* sp.	This paper
Kemp's Ridley (T2024/29)	Westward Ho, Devon, England	Dec. 2024	*Platylepas hexastylos*	This paper

Table 1. Barnacles reported on marine turtles in the waters around the U.K. and Ireland, 1874 to 2023. The barnacle nomenclature has been updated from original reports. See O'Reilly *et al*. (2022) for full source references.

It is possible that several other exotic turtle barnacle species have yet to be found in our waters (O'Reilly *et al*., 2022). These enigmatic creatures offer an insight into fascinating aspects of evolution and oceanic ecology. It is hoped that this communication will encourage biologists and veterinarians to examine stranded turtles more closely. The numbers of barnacles should be counted or photo-documented along with close-up photos to assist later identification. If barnacles are retained, they should be preserved, preferably in 96% ethanol to assist later molecular studies.

ACKNOWLEDGEMENTS

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REFERENCES

Arnold, E.N., Burton, J.A. & Ovenden, D.W. (2004). *Field Guide to Reptiles & Amphibians of Britain & Europe*. Harper Collins, London.

Bakir, K., Ozcan, T. & Katagan, T. (2010). On the occurrence of *Chelonibia patula* (Cirripedia) on the coasts of Turkey. *Marine Biodiversity Records* 3, e80. https://doi.org/10.1017/S1755267210000734

Barry, P.J. & Taylor, D. (2024). Discarded fishing gear aids trans-Atlantic transport of species from the Caribbean to UK Shores. *Bulletin of the Porcupine Marine Natural History Society* 21, 19-27.

Bate, C.C. (1878). Crustacea in revision of Couch's list of Crustacea in Cornish Fauna. *Journal of the Royal Institution of Cornwall* 19, 451- 522.

BBC (2015). Rare Columbus crabs from Bermuda wash up in Cornwall. https://www.bbc.co.uk/news/uk-england-cornwall-34983849 Accessed 28th December 2024.

Botterell, Z.L.R., Penrose, R., Witt, M.J. & Godley, B.J. (2020). Long-term insights into marine turtle sightings, strandings and captures around the UK and Ireland (1910-2018). *Journal of the Marine Biological Association of the United Kingdom* 100, 869-877. https://doi.org/10.1017/S0025315420000843

Boyd, L.L., Zardus, J.D., Knauer, C.M. & Wood, L.D. (2021). Evidence for host selectivity and specialization by epizoic *Chelonibia* barnacles between Hawksbill and Green Sea Turtles. *Frontiers in Ecology and Evolution* 9:807237. https://doi.org/10.3389/fevo.2021.807237

Broch, H. (1959). Cirripedia. Thoracica. Family Lepadidae. *Fiches d'Identification du Zooplancton: Zooplankton Sheet 83*. Conseil International pour l'Exploration de la Mer.

Brongersma, L.D. (1972). *European Atlantic Turtles*.

Rijksmuseum van Natuurlijke Historie, Leiden, The Netherlands.
Byrne, S. (2024). Barnacle Bill continues to be in care at the GSPCA as we wait for much needed paperwork to continue the journey home. Guernsey Society for the Prevention of Cruelty to Animals https://www.gspca.org.gg/blog/barnacle-bill-continues-be-care-gspca-we-await-much-needed-paperwork-long-journey-home Accessed 28th December 2024.
Casale, P., D'Addario, M., Freggi, D. & Argano, R. (2012). Barnacles (Cirripedia, Thoracica) and associated epibionts from sea turtles in the Central Mediterranean. *Crustaceana* 85, 533-549. https://doi.org/10.1163/156854012X634393
Chace, F.A. (1951). The oceanic crabs of the genera *Planes* and *Pachygrapsus*. *Proceedings of the United States National Museum* 101, 65-103. https://doi.org/10.5479/si.00963801.101-3272.65
Chan, B.K.K, Gale, A.S., Dreyer, B., Glenner, H., Ewers-Saucedo, C., Pérez-Losada, M. *et al.* (2021a). The evolutionary diversity of barnacles with an updated classification of fossil and living forms. *Zoological Journal of the Linnean Society* 193, 789 - 846. https://doi.org/10.1093/zoolinnean/zlaa160
Chan, B.K.K., Wong, Y.H., Robinson, N.J., Lin J.C., Yu, S.P., Dreyer, N. *et al.* (2021b). Five hundred million years to mobility: Directed locomotion and its ecological function in a turtle barnacle. *Proceedings of the Royal Society B* e288: 20211620. https://doi.org/10.1098/rspb.2021.1620
Cheang, C.C., Tsang, L.M., Chu, K.H., Cheng, I.J. & Chan, B.K.K. (2013). Host-specific phenotypic plasticity of the turtle barnacle *Chelonibia testudinaria*: a widespread generalist rather than a specialist. *PLoS ONE* 8(3): e57592. https://doi.org/10.1371/journal.pone.0057592
Cornwall Live (2017). Turtle found on Holywell Beach after 4,750 mile trip across the Atlantic Ocean has died. https://www.cornwalllive.com/news/cornwall-news/turtle-found-holywell-bay-beach-932744 Accessed 20th November 2023.
Cornwall Live (2022). Rare baby loggerhead turtle washes up on Cornwall beach 4,000 miles from home. https://www.cornwalllive.com/news/cornwall-news/rare-baby-loggerhead-turtle-washes-7863107 Accessed 20th November 2023.
Crowthers, J. & Crowthers, M. (1990). An amendment to the Crab Key. *Field Studies* 7, 483-484.
Davenport, J. (1994). A cleaning association between the oceanic crab *Planes minutus* and the loggerhead sea turtle *Caretta caretta*. *Journal of the Marine Biological Association of the United Kingdom* 74, 735-737. https://doi.org/10.1017/S0025315400047780
Davis, C.W. (1972). *Studies on the Barnacles Epizoic on Marine Vertebrates*. Master of Arts thesis, California State University, San Francisco, U.S.A.
De Boer, M. & Goverse, E. (2024). Groot aantal strandingen van zeeschild-padden op de Nederlandse kust. *RAVON 95 (Jaargang 26)* 4, 64-67.
Dellinger, T., Davenport, J. & Wirtz, P. (1997). Comparisons of social structure of Columbus crabs living on loggerhead sea turtles and inanimate flotsam. *Journal of the Marine Biological Association of the United Kingdom* 77, 185-194. https://doi.org/10.1017/S0025315400033865
Doyle, D.K., Helps, W. & Davenport, J. (2013). Columbus crab (*Planes minutus* (L.)) from the leg pouch of a loggerhead turtle (*Caretta caretta* (L.)). *Irish Naturalists' Journal* 32, 106-107.
Dutch News (2023). Two more rare turtles wash up on the Dutch coast. https://www.dutchnews.nl/2023/12/two-more-rare-turtles-wash-up-on-the-dutch-coast/#:~:text=In%20October%20an%20extremely%20rare,in%20Zoutelande%2C%20also%20in%20Zeeland Accessed 11th March 2024.
Epibiont Research Cooperative (2007). *A Synopsis of the Literature on the Turtle Barnacles (Cirripedia: Balanomorpha: Coronuloidea) 1758-2007*. Epibiont Research Cooperative Special Publication No. 1. http://www.seaturtle.org/documents/ERC-SP1.pdf Accessed 11th March 2024.
Frick, M.G., Ross, A., Williams, K.L., Bolten, A.B., Bjorndal, K.A. & Martins, H.R. (2003). Epibiotic associates of oceanic-stage loggerhead turtles from the southeastern North Atlantic. *Marine Turtle Newsletter* 101, 18-20.
Frick, M.G. & McFall, G. (2007). Self-grooming by loggerhead turtles in Georgia, USA. *Marine Turtle Newsletter* 118, 15.
Fuller W.J., Broderick, A.C., Enever R., Thorne P. & Godley B.J. (2010). Motile homes: a comparison of the spatial distribution of epibiont communities on Mediterranean sea turtles. *Journal of Natural History* 44, 1743-1753. https://doi.org/10.1080/00222931003624820
Gerlach, J., Muir, C. & Richmond, M.D. (2006). The first substantiated case of trans-oceanic tortoise dispersal. *Journal of Natural History* 40, 2403-2408. https://doi.org/10.1080/00222930601058290
Hayashi, R. (2012). Atlas of the barnacles on marine vertebrates in Japanese waters including taxonomic review of superfamily Coronuloidea (Cirripedia: Thoracica). *Journal of the Marine Biological Association of the United Kingdom* 92, 107-127. https://doi.org/10.1017/S0025315411000737
Hayashi, R. (2013). A checklist of turtle and whale barnacles (Cirripedia: Thoracica: Coronuloidea). *Journal of the Marine Biological Association of the United Kingdom* 93, 143-182. https://doi.org/10.1017/S0025315412000847
Hayashi, R. (2021) Past biodiversity: Japanese historical monographs document the epibiotic barnacles and cold-stunning event of the hawksbill turtle *Eretmochelys imbricata*. *Frontiers in Ecology and Evolution* 9:734415. https://doi.org/10.3389/fevo.2021.734415
Hayashi, R. & Ohtsuchi, N. (2025). Mobile habitats for the unseen passengers: the brachyuran crabs on the loggerhead sea turtles. *Journal of the Marine Biological Association of the United Kingdom* 105,

e4, 1-8. https://doi.org/10.1017/S0025315424001218
Holthuis, L.B. (1952). Enige interessante, met driivende voorweroen on de Nederlandse kust aangespoelde zeepissebedden en zeepokken. *De Levende Natuur* 55, 72-77.
Ingle, R.W. (1980). *British Crabs*. British Museum (Natural History), Oxford University Press, Oxford.
ITV (2023). Turtle, named 'Barnacle Bill', rescued after getting lost during Storm Ciarán. https://www.itv.com/news/channel/2023-11-06/barnacle-bill-turtle-rescued-after-getting-lost-during-storm-ciarn Accessed 11th March 2024.
King, G.L. & Berrow, S.D. (2009). Marine Turtles in Irish Waters. *Irish Naturalist's Journal* Special Marine Turtle Supplement 1-35.
Lamont, M.M., Catizone, D.J., O'Connor, L.R., Blais, R., Rodriguez, L. & Holmes, C. (2021). Natural History Notes: *Malaclemys* Terrapin (Diamond-backed Terrapin). Lepadomorph epibionts. *Herpetological Review* 52, 633-634.
Lazo-Wasem, E.A., Pinou, T., Peña de Niz, A. & Feuerstein, A. (2011). Epibionts associated with the nesting marine turtles *Lepidochelys olivacea* and *Chelonia mydas* in Jalisco, Mexico: a review and field guide. *Bulletin of the Peabody Museum of Natural History* 52, 221-240. https://doi.org/10.3374/014.052.0203
Lutcavage, M. & Musick, J.A. (1985). Aspects of the biology of sea turtles in Virginia. *Copeia* 1985(2), 449-456. https://doi.org/10.2307/1444857
McInerny, C.J. & Minting, P.J. (2016). *The Amphibians and Reptiles of Scotland*. Glasgow Natural History Society, Glasgow.
Monroe, R. & Limpus, C.J. (1979). Barnacles on turtles in Queensland waters with descriptions of three new species. *Memoirs of the Queensland Museum* 19, 197-223.
Monzon-Arguella, C., Lopez-Jurado, L.F., Rico, C., Marco, A., Lopez, P., Hays, G.C. & Lee, P.L.M. (2010). Evidence from genetic and Lagrangian drifter data for transatlantic transport of small juvenile green turtles. *Journal of Biogeography* 37, 1752-1766. https://doi.org/10.1111/j.1365-2699.2010.02326.x
Moriarty, J.E., Sachs, J.A. & Jones, K. (2008). Directional locomotion in a turtle barnacle, *Chelonibia testudinaria*, on Green Turtles *Chelonia mydas*. *Marine Turtle Newsletter* 119, 1-4.
O'Reilly, M., Brownlow, A., Ten Doeschate, M., Fenwick, D. & Penrose, R. (2022). Marine turtles and their barnacles from Scottish waters and adjacent seas. *The Glasgow Naturalist* 27(4), 27- 43. https://doi.org/10.37208/tgn27419
O'Riordan, C.E. (1979). Marine fauna notes from the National Museum of Ireland 6. *Irish Naturalists' Journal* 19, 356-358.
O'Riordan, C.E., Holmes, J.M.C. & Sleeman, D.P. (1984). First recorded occurrence of the Hawksbill Turtle (*Eretmochelys imbricata* (L.)) in Irish waters. *Irish Naturalists' Journal* 21, 274-275.
Penrose, R.S. (2004). *UK & Eire Marine Turtle Strandings and Sightings. Annual Report 2003*. Marine Environmental Monitoring, Llechryd, Wales. https://strandings.com/wp-content/uploads/simple-file-list/2003-Turtle-Strandings-Report.pdf Accessed 24th March 2025.
Penrose, R.S. & Westfield, M.J.B. (2023). *British & Irish Marine Turtle Strandings and Sightings. Annual Report 2022*. Marine Environmental Monitoring, Llechryd, Wales. https://strandings.com/wp-content/uploads/simple-file-list/2022-Turtle-Stranding-Report.pdf Accessed 24th March 2025.
Penrose, R.S. & Westfield, M.J.B. (2024). *British & Irish Marine Turtle Strandings and Sightings. Annual Report 2023*. Marine Environmental Monitoring, Llechryd, Wales. https://www.ukturtles.online/Graphics%20active/2023%20Turtle%20Annual%20Strandings%20Report.pdf Accessed 24th March 2025.
Pfaller, J.B., Payton, A.C., Bjorndal, K.A., Bolten, A.B. & McDaniel, S.F. (2019). Hitchhiking the high seas: global genomics of rafting crabs. *Ecology and Evolution* 9, 957-974. https://doi.org/10.1002/ece3.4694
Pierpoint, C. & Penrose, R. (2002). *'TURTLE' A database of Marine Turtle Records for the United Kingdom and Eire. (Version 1.3 2002): Introduction, Data Summary and User Notes*. Marine Environmental Monitoring, Llechryd, Wales.
Quigley, D.T.G (2013). First authenticated record of green turtle *Chelonia mydas* (L.) from Irish waters, with a review of Irish and UK records. *Herpetological Bulletin* 123, 8-12.
Rees, E.I.S. & Walker, G.A. (1993). A record of the turtle barnacle *Chelonibia testudinaria* (L.) in the Irish Sea. *Porcupine Newsletter* 5, 189.
Ritchie, J. (1924a). The Loggerhead Turtle in Scotland. *The Scottish Naturalist* 149, 99-103.
Ritchie, J. (1924b). Turtle barnacles in Scottish waters. *The Scottish Naturalist* 149, 166.
Southward, A.J. (2008). *Barnacles*. Synopses of the British Fauna. New Series No. 57. Field Studies Council, Shrewsbury.
Taylor, R.H.R. (1963). The distribution of amphibians and reptiles in England and Wales, Scotland and Ireland and the Channel Isles: a revised survey. *British Journal of Herpetology* 3, 95-115.
Trewhella, S. & Hatcher, J. (2015). *The Essential Guide to Beachcombing and the Strandline*. Wild Nature Press, Oxford. https://doi.org/10.1515/9780691232423
Witt, M.J., Penrose, R. & Godley, B.J. (2007). Spatio-temporal patterns of juvenile marine turtle occurrence in waters of the European continental shelf. *Marine Biology* 151, 873-885. https://doi.org/10.1007/s00227-006-0532-9
Zann, L.P. & Harker, B.M. (1978). Egg Production of the barnacles *Platylepas ophiophilus* Lanchester, *Platylepas hexastylos* (O. Fabricius), *Octolasmis warwickii* Gray and *Lepas anatifera* Linnaeus. *Crustaceana* 35, 206-214. https://doi.org/10.1163/156854078X00114

Zardus, J.D. (2021). A global synthesis of the correspondence between epizoic barnacles and their sea turtle hosts. *Integrative Organismal Biology* 3, obab002. https://doi.org/10.1093/iob/obab002

Zardus, J.D. & Hadfield, M.G. (2004). Larval development and complemental males in *Chelonibia testudinaria*, a barnacle commensal with sea turtles. *Journal of Crustacean Biology* 24, 409-421. https://doi.org/10.1651/C-2476

Zardus, J.D., Lake, D.T., Frick, M.G. & Rawson, P.D. (2014). Deconstructing an assemblage of 'turtle' barnacles: species assignments and fickle fidelity in *Chelonibia*. *Marine Biology* 161, 45-59. https://doi.org/10.1007/s00227-013-2312-7

Zullo, V.A. (1979). *Marine Flora and Fauna of the Northeastern United States. Arthropoda. Cirripedia*: NOAA Technical Report NMFS Circular 425. National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

Zullo, V.A. (1982). A new species of turtle barnacle *Chelonibia* Leach, 1817 (Cirripedia, Thoracica) from the Oligocene Mint Spring and Byram formation of Mississippi. *Mississippi Geology* 2(3), 1-6.

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Glasgow fungal collections

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ABSTRACT
Fungal specimens belonging to various Glaswegian Institutes and Universities are now brought together and are housed in the Glasgow Museums Resource Centre. A summary of the origins and numbers of the specimens is provided, along with notes on the main collectors. There are also brief references to the lichen and slime mould collections.

INTRODUCTION
Whilst researching the whereabouts of a lost copy of Elias Fries's *Scleromyceti Sueciae,* now safe at the Glasgow Museums Resource Centre (GMRC) (Watling, 2024), RW realised that many other non-lichenised fungal collections had now been brought together under one roof under the curation of KW.

The GMRC is a recent purpose-built store, managed by Glasgow Life on behalf of Glasgow City Council, housing over one million objects, nearly half of which are natural history specimens (https://collections.glasgowmuseums.com/mwebcgi/mweb?request=collection).

Glasgow Life Museums holds Glasgow's civic collection (Herb GLAM), which was previously housed in the Art Gallery and Museum at Kelvingrove (Jones, 1980). In 1991 the herbarium of the former Royal College of Science and Technology, now part of the University of Strathclyde (formerly Anderson's College, Glasgow) (Herb GGO) was gifted to the museum (Lloyd, 1964). A few years later, in 2005, the British herbarium of the University of Glasgow's former Department of Botany (Herb GL) was also transferred (Patton, 1954).

In total there are nearly 150,000 botanical specimens now housed at the GMRC, of which nearly 2,000 are non-lichenised fungi (see Table 1). Overall, botanical specimens date from the late 18th century to modern times, but most of the fungal specimens were collected in the 20th century.

The fungi now housed in the GMRC cover a wide timespan and help in our understanding of the distribution of Scottish fungi. They also contain clues to changes in the mycobiota. KW has been able to database the collections and both RW and KW felt strongly that the coverage and whereabouts of these collections should be made available to everyone for future research. The specimens are mostly of dried samples in paper packets or boxes, plus some (older) sections on herbarium paper or some (modern) freeze-dried specimens.

Apart from the fungarium at the Royal Botanic Gardens Kew, where there are many Scottish fungal specimens, there are three other significant collections all based in Scotland, *viz.* in the Royal Botanic Gardens Edinburgh, University of Aberdeen and Glasgow. The last is the subject of this paper.

Edinburgh has by far the largest mycological collection with over 150,000 specimens (https://www.rbge.org.uk/science-and-conservation/herbarium/our-collections/fungi). The Aberdeen collections are based on the specimens of Professor G. Dickie (Ainsworth *et al.*, 1996, p. 57) and of Professor Helenius Trail (Ainsworth *et al.*, 1996, p. 173). The latter's collections are unique in that they are arranged under the name of the substrate, as many are plant pathogens, and then under the name of the organism. They have been catalogued thanks to a grant from the British Ecological Society. Watling (1986) provides a review of historical Scottish mycological developments.

Collection	Fungi	Slime Moulds	Lichens
GL (University of Glasgow)	776	159	2,601
GL (Fries)	263	0	0
GGO (University of Strathclyde)	256	61	336
GLAM (Glasgow Museums)	702	0	2,445
Total	1,997	220	5,382

Table 1. Summary of fungal collections held at the Glasgow Museums Resource Centre. The total number of specimens is 7,599; GLAM, and therefore the overall total, exclude the *ca.* 700 specimens collected by Alan Silverside.

There are only a few very early references to local fungi. As early as 1777, the Reverend J. Lightfoot (Ainsworth *et al.*, 1996, p.110) had named a handful of larger fungi (Lightfoot, 1777) but, unfortunately, he retained no specimens. Fifteen years later, the Reverend David Ure named a handful of fungi but kept no specimens (Ure, 1793). Similarly, Thomas Hopkirk (Ainsworth *et al.*, 1996, p. 96), an influential Glasgow businessman, produced a long list of fungi for the Clyde area (Hopkirk, 1813) but kept no specimens even though his *Flora Glottiana* has become a clarion call to west coast mycologists as their starting point in distributional data for Scotland. Watling (2019) provides a review of some early recording in the Glasgow area.

The Kew fungarium was developed around the plant collections of Sir W.J. Hooker, the first director at Kew (Ainsworth *et al.*, 1996, p. 94) within which were many fungal specimens. Prior to this appointment, Hooker was Professor of Botany (1820-1841) at the University of Glasgow, where he employed J.F. Klotzsch (Ainsworth *et al.*, 1996, p.104) to collect fungi for him and arrange his herbarium of fungi. Although Klotzsch himself collected extensively around Glasgow and in neighbouring localities, only 56 specimens are today represented in the GMRC collection (Watling, 2014).

FUNGI

University of Strathclyde (Herb GGO)

Professor Blodwen Lloyd Binns, a microbiologist at the then Royal College of Science and Technology, was instrumental in saving the herbarium, which had been "discovered" in the 1950s. She spent many years cataloguing and researching this historic collection (Lloyd, 1964; Nelson, 2014). The GGO botanical collections comprises 13,400 objects of which 256 are fungal specimens.

Professor Roger Hennedy (Ainsworth *et al.*, 1996, p. 90), who authored the first flora of the Clyde area (Hennedy, 1865), started as a woodcutter before becoming Professor at the then Anderson College, Glasgow. Fungi were not included in his book and, although known as an algologist and vascular plant botanist, he accumulated some 77 fungal specimens now held in Glasgow, a significant number for this early period. They are dated between 1857 and 1865, except for one dated 1845 (Fig. 1).

Several of Hennedy's specimens are initialled by Charles Bagge Plowright, a very influential mycologist in the early 1900s (Ainsworth *et al.*, 1996, p. 139); he was a G.P. acting from King's Lynn and earlier had studied in Glasgow. It is presumed that Lloyd Binns had some of the material vetted by him. Plowright was the author of what was, until recently, the standard work on British rust-fungi (Plowright, 1889), although some ten years earlier he had distributed around 300 specimens in the form of an exsiccati collection named *Sphaeriacei Britannici.*

The largest number of specimens (116) was collected by the Reverend Robert Barr in the 1930s. Barr was the longest serving minister at the Neilston (Old) Parish Church. He collected from a broad range of local sites, including around the Neilston Manse (Fig. 2), but several result from his visits to the east of Scotland and attendance at the forays of the Cryptogamic Society of Scotland. There are 17 specimens collected from Fyvie Castle and Durris during an excursion to Aberdeenshire over three days in October 1931.

Fig 1. *Geaster fimbriatus* (sessile earthstar). Collected by Professor Roger Hennedy from the Isle of Cumbrae in 1861. C.B. Plowright (CBP initialled) checked it. The label information is quite detailed for such an old specimen (Herb GGO: B.2008.47.5.319). (Photo: © CSG CIC Glasgow Museums Collection)

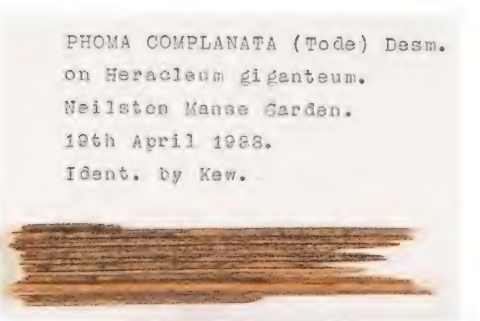

Fig. 2. *Phoma complanata* (= *Calophoma complanata*). Collected by the Reverend Robert Barr in 1933 from the manse garden at Neilston in 1933. The fungus is a pathogen of umbellifer species. It is described as growing on giant hogweed (*Heracleum mantegazzianum*), a novel plant at the time (Herb GGO: B.2008.47.5.326). (Photo: © CSG CIC Glasgow Museums Collection)

Also present during this excursion was R.B. Johnstone who added 23 specimens to the herbarium. There are 12 specimens, collected a little earlier (1911-1922) by Daniel Andrew Boyd (see below for more details on these collectors). Johnstone is also known to have collaborated with Professor G.F. Scott Elliot, who is represented by 10 specimens. Lloyd Binns named the GGO cryptogamic herbarium in Scott Elliot's honour. He was Professor at the then Glasgow and West Scotland Technical College (1895-1903), and president of the Dumfries and Galloway Natural History and Antiquarian Society (1902-1909). A few specimens from their collaboration are held in the Edinburgh fungarium and are noted in Watling (2025), which is a revision of Stevenson (1879).

There is a scattering of other old specimens, e.g. those provided by "Mr Combe" (1862) and "Dr Ayres" (1844), and some of note connected with wine production and dry rot by "Dr Colquhoun" (1862).

University of Glasgow (Herb GL)

The British herbarium of the University of Glasgow's former Department of Botany consists of nearly 70,000 specimens of which 776 are fungi stored in the 31 boxes (not including the 263 specimens of Fries's *Scleromyceti Sueciae*; see below). There appear to be no specimens associated with 19th century Professors of Botany such as Sir W.J. Hooker, J.H. Balfour or G.A. Walker Arnott. The specimens are mostly dated from the 1930s to the 1960s.

Stephen Hutchinson was a lecturer in mycology in the Department of Botany and, although he was not a systematist, he was the person who first brought to attention the existence of an uncut copy of Fries's *Scleromyceti Sueciae* (Watling, 2024). He contributed only a few specimens (41), his main contribution being through his students, *viz.* Geoff Hadley (41) who was later a mycologist at the University of Aberdeen and contributed specimens there; Dorothy Losel (née McTeague) (40), later at the University of Sheffield; and J. Taggart (5). In addition, he hosted Richard Korf, a founder of the journal *Mycotaxon*, from Syracuse University, Ithaca, U.S.A. Korf added seven specimens, some in collaboration with "W. Fletcher" (presumably the former Professor of Botany at Strathclyde University).

One of the earliest collectors was Daniel Andrew Boyd (Ainsworth *et al.*, 1996, p. 24) who donated 127 specimens dating from 1892-1933 (Fig. 3). Although he was a Writer to the Signet in Scotland, he never practised, instead devoting himself until his death to natural history. Boyd collected extensively and enthusiastically around Saltcoats and Stevenston (Ayrshire), and East Kilbride (Lanarkshire). He first took an interest in basidiomycetes, of which there does not appear to be any voucher material, but then became fascinated with microfungi on which he later became an expert, certainly in their collection. Boyd was a past president of the Scottish Cryptogamic Society and, along with Donald Patton, co-authored the second

Fig. 3. *Cylindrosporeum niveum* (= *Ramularia calthae*): an example of a microfungus collected by Daniel Boyd in 1920 from Skelmorlie Glen, Ayrshire. It occurs as leaf spots on marsh marigolds (*Caltha palustris*) (Herb GL: B.2008.48.5.43). (Photo: © CSG CIC Glasgow Museums Collection)

edition of the British Association booklet (1928). He published many articles and added many species to the British list (Ainsworth & Waterhouse, 1989; Ramsbottom, 1963). A tiny fraction of his specimens is discussed by Watling (2021) who demonstrated the great importance of his work for our understanding of the distribution of Scottish fungi.

Due to Boyd's communications with John Ramsbottom (Ainsworth *et al.*, 1996, p. 144) and Annie Lorraine Smith (Ainsworth *et al.*, 1996, p. 161), who were both at the British Museum of Natural History, now the Natural History Museum, his specimens went there for confirmation of their identity or their description as new species, or to W.B. Grove (Ainsworth *et al.*, 1996, p. 81), the British authority on stem and leaf fungi, who was based at the Birmingham Technical School. The Natural History Museum collections went to Kew under what was termed the Morton agreement whereby the Natural History Museum no longer kept fungal specimens, which is ironic, as lichens are now recognised and classified as fungi.

By far the largest contributor to GL collection was Robert B. Johnstone, who collected 202 specimens chiefly between 1913 and 1934 (Fig. 4). His son, R.H. Johnstone (Ainsworth *et al.*, 1996, p. 102), was also a very active amateur mycologist (adding 54 specimens), who collected many larger fungal specimens both about Glasgow and when he attended field meetings in various localities in the U.K. He became unofficial curator of the fungal collections held by the University of Glasgow Department of Botany until his death, after which Pam Wilkins (wife of Regius Professor Malcolm Wilkins) had a watching brief until the former Departments of Zoology and Botany were remoulded to fit modern trends.

Fig. 4. *Auricularia auricula-judae* (jelly ear). One of over 200 specimens of fungi collected by R.B. Johnstone, mainly in the 1930s (Herb GL: B.2008.48.5.435). (Photo: © CSG CIC Glasgow Museums Collection)

Several of the collections Johnstone administered are from the British Mycological Society and European Mycological Congress forays in 1950 and 1960 respectively, with specimens collected by the late Professor John Manners (34 specimens), University of Southampton, the late Professor John Webster (9) then Sheffield University, later Exeter, and the late Derek Reid (3) of the Botanic Gardens, Kew, London. The dedicated amateur mycologist J.T. Palmer of Stockport, Cheshire added nine specimens but he also examined and redetermined the gasteromycetes in the collection whilst researching for his compilation of the British gasteromycetes (Palmer, 1968).

John Walton was Professor of Botany at the University of Glasgow (1930-1962) and, although a palaeobotanist, added 23 fungal specimens. He also realised the significance of Hutchinson's opinion on the importance of the *Scleromyceti Sueciae* mentioned above.

There is little doubt that the specimens donated or examined in Glasgow by Mrs N.L. Alcock were encountered in her capacity as a plant pathologist at the Department of Agriculture and Fisheries for Scotland and based in offices at the Royal Botanic Garden Edinburgh. Similarly, the collections assigned to Dr John Grainger and those of Barbara Colson are from their time as plant pathologists at, respectively, the West of Scotland Agricultural College, Auchincruive, Ayrshire and the plant pathology laboratory of the Royal Horticultural Society at Wisley, Surrey.

Glasgow Museums (Herb GLAM)

Glasgow Museums holds 702 specimens, mostly collected locally and from the late 1970s to post-2000. These are part of Glasgow's civic collection, several being formerly displayed in popular exhibits at the Kelvingrove Art Gallery and Museum.

There is a small number of 19th century specimens some of which are of considerable historical interest. There are 29 fungal specimens collected by the Reverend John Fleming, some dating from 1799. Fleming became Professor of Natural Philosophy at Aberdeen University in 1834, which was just after Klotzsch left Glasgow. He left the established church in 1843 and two years later he became Professor of Natural Sciences at the Free Church College in Edinburgh. He was elected president of the Botanical Society of Edinburgh three times. His herbarium was gifted to Glasgow Museums by a relative, Major Fleming, and comprises over 2,700 specimens (including geological and zoological objects, though the majority are botanical).

As noted above, one of the oldest collections of specimens now in the GMRC is a small quantity of Klotzsch material. It is thought to belong to the Fleming collection, but how Fleming came to own these specimens is unknown. The 56 specimens were collected mostly in 1831 and mainly from the Glasgow area but include several from Inveraray, Argyll. The collection adds to our understanding of the historical distribution of the mycobiota although none of the exsiccati are significant, apart from a milk-cap he identified as the much-confused *Agaricus smithii* (Fig. 5). As indicated by Klotzsch in his notes and repeated by Berkeley (1836), *A. smithii* was named after the Reverend Colin Smith, who collected the specimens at Inveraray, and not, as many have thought, the well-known English mycologist Worthington G. Smith (Smith, 1918). Colin Smith collected other material at Inveraray, now in the GMRC. Fleming's fungus appears to be close to, if not conspecific with, what is known today as *Lactaria mammosus* Fr., a milk-cap described as new two years later than Berkeley's description. Berkeley supported Klotzsch in thinking it distinct, suggesting it was intermediate between "*Agaricus Volémum*" [*sic*] (now *Lactifluus volemus* (Fr.) Kuntze) and *Agaricus subdulcis* (now *Lactaria subdulcis* Pers. Gray). Unfortunately, there is a slight discrepancy in habitat details, as Klotzsch indicated it was found in beech woods (*Fagus sylvatica*) "in mountainous places" and that it had also been found by Hooker in Helensburgh and Klotzsch himself in Glasgow. The material in hand has basidiospores agreeing in their ornamentation with *L. mammosus* and the cystidia are in good agreement. However, slight differences such as habitat, tuberculated pileus-margin etc. would not support the case for resurrecting "*smithii*" and placing it in its rightful genus, even though the specimen is probably the type of the taxon.

A small but interesting set of specimens in the Museums' collection, dating to 1846, is that of James Davies. These were collected from the Edinburgh area,

Fig. 5. *Agaricus smithii* (*Lactarius* sp. – milk-cap). A taxonomically important early collection from Inveraray, Argyll in 1831. It is one of Johan Klotzsch's specimens, forming part of the John Fleming collection. Klotzsch's signature can be seen below the text (Herb GLAM: NHB.1980.27.27). (Photo: © CSG CIC Glasgow Museums Collection)

especially the Botanic Gardens (12 specimens in total) (Fig. 6) and donated as part of the Glasgow Botanical Society's collection in 1882. We have no further information on Davies or his connection to Glasgow.

Most of the specimens in the collection result from the activities of museum staff along with members of the GNHS on a range of forays, many in the 1980s. Dr Agnes Walker was probably the most conspicuous and active collector until her retirement in the early 1990s; she added many specimens to the collections made during local forays or from further afield elsewhere in Scotland and abroad (although these last are not in the collection). Her forays were often in collaboration with members of the Kelvingrove staff, including Charlie Palmar, Gwyneth Jones and Geoff Hancock, and she was a participant in many GNHS excursions, some led by Dr Alan Silverside. Other contributors include N. Reid, J. Shore, J. Garry, G.L. Vares and S. Buchan.

One prolific forager and collector was the late Dick Hunter, well known to older members of GNHS from forays in the 1980s. He was a Greenkeeper at Milngavie Golf Course, near Glasgow, and had a passionate interest in larger fungi, many of which he illustrated in colour. He sent RW many specimens for determination

Fig. 6. *Agaricus procerus* (*Chlorophyllum rachodes* – shaggy parasol). An example of one of several specimens, dated 1846, from the Botanic Garden in Edinburgh made by James Davies, about whom nothing is currently known (Herb GLAM: NHB.1882.31.8). (Photo: © CSG CIC Glasgow Museums Collection)

or confirmation, always supported by good descriptions of his finds and sketch-book paintings. His collections are from around Milngavie and some were collected along with Elizabeth Farquharson, a member of the South East Scotland Fungus Group. Agnes Walker and KW also benefitted from attending courses at Kindrogan and many expertly determined specimens from that area are in the collection; KW's attendance resulted in an additional 60 specimens.

MYXOMYCETES (SLIME MOULDS)

Although now recognised as not being closely related to fungi, slime moulds have traditionally been studied and curated along with fungi within botanical collections. There are two important collections of Myxomycetes now in the GMRC. Both collections contain type material and were made by Arthur Lister and his daughter, Gulielma, well-known for their various editions of *A Monograph of the Mycetozoa* (Lister, 1894) (Ainsworth *et al.*, 1996, p. 111). The GGO collection contains 61 specimens and the GL collection 159; the latter set was gifted to Professor F.O. Bower of the Botany Department following a visit by the Listers to Glasgow in 1901. The specimens were collected mostly from southern England including Luton, Flitwick (Bedfordshire) and Lyme Regis (Dorset); in total 36 of the specimens are of species named by the Listers.

LICHENS

In addition to the above, the GMRC holds a large collection of lichens (lichenised fungi), consisting of dried samples in labelled paper packets. These are described briefly in this paper but are worthy of a separate, full-length article (see Table 1).

The smallest collection is that of Herb GGO with 336 specimens. They are mostly linked to the chief collectors Hennedy, Scott Elliot and Scouler, and their correspondents, and they include some overseas material.

Herb GL comprises solely British material (2,601 specimens) many dating from the 19th century. A large collection is that of the Reverend David Lillie (many from northern Scotland), and there are also "*Lichenes Brittanici exsiccati*" specimens by the Reverend William Leighton.

The museum's civic collection comprises over 2,500 specimens, of which nearly 1,000 are from overseas. The largest and most important are those of James Stirton, some 300 of which are type specimens of names that he published. The British collection includes a collection by William Mudd (273 specimens) as well as more recent collections by Pauline Topham and museum staff.

DISCUSSION

The above-mentioned collectors contributed massively to our early knowledge of the fungi of the Clyde area. The historical specimens held at Glasgow are limited in scale but include valuable specimens from 19th century pioneers. Together with specimens held elsewhere, they represent valuable vouchers for ongoing mycological research into our historical Scottish mycobiota.

The first half of the 20th century saw more active forays and collecting by amateurs, linked to early natural history societies. The University of Glasgow collection developed during this period and reflected an academic interest in plant pathogens. Later in 20th century, much of the local activity relates to excursions of local naturalists, many linked to the GNHS. However, by the new millennium a small group of more serious amateurs and academics came together to form the Clyde and Argyll Fungus Group, inaugurated in 2007. Founding members included Alan Silverside, Graeme Walker, David Walkinshaw, Dick Peebles, Robin Jones and RW. The group is very active today, generating many records, many of species new to the area, and made possible by the dedicated work of Dick Peebles; if any specimens are retained to substantiate the record they are currently in private hands. Dick Peebles tries to attend all the fungus forays in the west and records assiduously all the species seen. These records are placed on the national database run by the British Mycological Society (FRDBI: Fungal Records Database of Britain and Ireland).

Yet to be fully processed is an extensive and important collection made by the late Alan Silverside of the University of the West of Scotland (formerly Paisley College of Technology) who sadly died in November 2023. He collected extensively in Scotland, with many specimens from sites along the River Clyde from Blantyre to Lanark, and other places including about Paisley, the Renfrewshire Hills, Ardentinny in Cowal and the Kindrogan Field Centre, Perthshire where he conducted a fungus course for students. Alan was the leading authority on fungi in the west of Scotland and produced a checklist of the Fungal Flora of the Clyde area (Silverside, 1991). Many unprocessed specimens and microscopic slides were found at his flat after his death, which Graeme Walker and KW were able to extract with permission from the family. These are in the process of being curated: there are well over 700 specimens, a significant contribution to the museum's collection and a valuable reference collection of some of the rarer fungi found in Scotland.

REFERENCES

Ainsworth, G.C., Webster, J. & Moore, D. (1996). *Brief Biographies of British Mycologists.* British Mycological Society, Stourbridge.

Ainsworth, G.C. & Waterhouse, G.M. (1989) *British County Foray Lists (up to the end of 1986)*. British Mycological Society, Cambridge.

Berkeley, M.J. (1836). *The English Flora of Sir James Edward Smith. Class XXIV. Cryptogamia. Vol. V. Part II. Fungi*. Longman, Rees, Orme, Brown, Green & Longman, London.

Hennedy, R. (1865). *The Clydesdale Flora*. David Robertson, Glasgow.

Hopkirk, T. (1813). *Flora Glottiana*. J. Smith & Son, Glasgow.

Jones, G. (1980). The herbarium of the Glasgow Museum and Art Gallery. *The Glasgow Naturalist* 20(1), 51-56. https://doi.org/10.3366/gas.1979.6.6.56

Lightfoot, J. (1777). *Flora Scotica.* B. White, London.

Lister, A. (1894). *A Monograph of the Mycetozoa*. British Museum, London.

Lloyd, B. (1964). The herbarium of the Royal College of Science & Technology, Glasgow. *The Glasgow Naturalist* 18(7), 363-368.

Nelson, C. (2014). *John Scouler, Scottish Naturalist: A Life with Two Voyages*. Glasgow Natural History Society, Glasgow.

Palmer, J.T. (1968). A chronological catalogue of the literature of the British Gasteromycetes. *Nova Hedwigia* 15, 65-178.

Patton, D. (1954). The British Herbarium of the Botanical Department of Glasgow University. Glasgow. *The Glasgow Naturalist* 17(3), 105-126.

Plowright, C.B. (1889). *A Monograph of the British Uredineae and Ustilagineae*. Kegan Paul, Trench & Co., London.

Ramsbottom, J. (1963). History of Scottish mycology. *Transactions of the British Mycological Society* 46, 161-178 https://doi.org/10.1016/S0007-1536(63)80072-8

Silverside, A.J. (1991). *Fungus Flora of the Mid-Clyde Valley*. [An unpublished ongoing listing, Version 3.1, 1-65]

Smith, A.L. (1918). Worthington G. Smith as mycologist. *Transactions of the British Mycological Society* 6, 65-67. https://doi.org/10.1016/S0007-1536(17)80013-9

Stevenson, J. (1879). *Mycologia Scotica*. Cryptogamic Society of Scotland, Edinburgh.

Ure, D. (1793). *The History of Rutherglen and East-Kilbride*. David Niven, Glasgow.

Watling, R. (1986). 150 years of paddock stools: a history of agaric ecology and floristics in Scotland. *Transactions of the Botanical Society of Edinburgh* 45(1), 1-42. https://doi.org/10.1080/03746608608685403

Watling, R. (2014). Johan Frederick Klotzsch's pre-1850 material in the Glasgow Museums collections and its significance. *The Glasgow Naturalist* 26(1), 93-100.

Watling, R. (2019). The tale of the fungi of two gardens: non-lichenised fungi of the Botanic Gardens in Glasgow. *The Glasgow Naturalist* 27(1), 57-67. https://doi.org/10.37208/tgn27111

Watling, R. (2021). Daniel Alexander Boyd 1855-1928, a formidable amateur Scottish mycologist. *The Glasgow Naturalist* 27(4), 22-26. https://doi.org/10.37208/tgn27408

Watling, R. (2024). The Edinburgh and Glasgow copies of Elias Fries's *Scleromyceti Sueciae*. *The Glasgow Naturalist* 28(2), 28-29. https://doi.org/10.37208/tgn29207

Watling, R. (2025). *Mycologia Scotica*. https://sites.google.com/site/scottishfungi Accessed 7th April 2025.

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SHORT NOTES

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A first occurrence of Adonis' ladybird *Hippodamia variegata* (Coleoptera: Coccinellidae) in Glasgow, Scotland

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Adonis' ladybird (*Hippodamia variegata* (Goeze, 1777)) is native to the U.K. but has been recorded rarely from Scotland (NBN, 2024). An adventitious (i.e. arriving from outwith the U.K.) specimen was reported from Dumbarton, Scotland (as *Adonia variegata*) by Futter (2000) and was thought at the time to be the first Scottish record. However, the National Biodiversity Network Atlas (NBN, 2024) now shows a 1992 sighting in Morar, north-west Scotland which, like the Dumbarton specimen, was found on imported grapes. We now have a sighting in west central Scotland which is surely not adventitious. On 17th September 2024, a single specimen was swept from a patch of creeping thistles (*Cirsium arvense*) at Hamiltonhill Claypits, Glasgow (NS58526722) by the author.

In addition, there have been several sightings in the Lothians, Scotland in recent years, and one in the Scottish Borders (NBN, 2024). The first of the Lothians records was found in 2018 by Dorothy Lyle by the Water of Leith near Murrayfield, Edinburgh (Fig. 1). Later that year, David Horsfield found another in the grounds of Astley Ainsley Hospital in Edinburgh. Further records elsewhere in Edinburgh and East Lothian were added to the NBN Atlas by the U.K. Ladybird Survey and, together with the Glasgow and earlier Edinburgh records, seem to indicate a natural extension of the range of this species northwards into Scotland, though it has not yet been recorded in south-east Scotland (Mark Pollitt, South West Scotland Environmental Information Centre, pers. comm.).

Though the species is often associated with coastal dune habitats (Roy, 2018), only two of the Lothians records are from the coast of the Firth of Forth, and even there the habitat seems more akin to the "inland" preferences listed by Roy: vegetation adjacent to bare areas of sand, shingle or shale. The location of the Glasgow specimen was indeed adjacent to bare ground which had been cleared in recent years. Duff (2016) describes it as "very local" in northern England and southern Scotland.

Fig. 1. Adonis' ladybird (*Hippodamia variegata*), length *ca.* 5 mm, Water of Leith, Edinburgh, 16th July 2018. (Photo: Dorothy Lyle)

The Glasgow specimen was donated to the Hunterian Museum, and the record will be submitted to the NBN Atlas along with other recent records of Coccinellidae in due course.

I am grateful to Ashleigh Whiffin at National Museum Scotland for access to specimens held in the collections there, to Dorothy Lyle for her photo and details of her sighting, and to the late Stephen Moran for details of the Morar specimen, which is held by Inverness Museum.

REFERENCES

Duff, A.G. (2016). *Beetles of Great Britain and Ireland, Volume 3: Geotrupidae to Scraptidae*. A.G. Duff, West Runton, Norfolk.

Futter, S. & Futter, K. (2000). Casual Record of Adonis' ladybird (*Adonia variegata*) in Dumbarton. *The Glasgow Naturalist* 23(5), 55.

NBN (2024). National Biodiversity Network Atlas. https://species.nbnatlas.org/species/NBNSYS0000008315 Accessed 14th December 2024.

Roy, H. & Brown, P. (2018). *Field Guide to the Ladybirds of Great Britain and Ireland*. Bloomsbury, London.

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The elusive green alga *Catena viridis* Chodat: a possible second record for the British Isles from Scotland

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This note concerns an unusual algal specimen that was recorded in a sample collected from Loch Ore, Fife, Scotland on 14th August 2024, during a routine phytoplankton analysis carried out as part of the Scottish Environment Protection Agency's (SEPA) monitoring of the ecological status of freshwater lochs using phytoplankton. The open-water sample had been collected using a throw sampler from the shore at the north-eastern edge of the loch at the yacht jetty near the outlet, and immediately preserved with Lugol's solution.

Loch Ore is a large (surface area 0.85 km^2, volume 4.47×10^6 m^3), shallow (mean depth 5.3 m), high alkalinity (mean alkalinity 1,788 µEq L^{-1} , mean colour 29.3 mgPt L^{-1}) freshwater loch. Its catchment area (24.32 km^2) is coniferous woodland (33%), improved grassland (23%), arable horticulture (12%) and broadleaved woodland (8%). The overall ecological status of the loch is currently classified as "Moderate", while the phytoplankton has reached "High" ecological status (SEPA, 2025) and has been usually dominated by diatoms (*Cyclotella* spp. and *Acanthoceras zachariasi*), cryptophytes (*Cryptomonas* spp.) and chlorophytes (*Pediastrum* spp. and *Pandorina morum*) over 2022-2024 (data from months of July to September only).

No live sample could be taken and used for examination. Photographs taken from the sample at ×1,600 magnification (oil immersion) highlighted cells 4-5 µm long by 1.0-1.5 µm wide, bar-bell-like with thickened caps at either end (Fig. 1). Cells were relatively abundant at 4,953 cells ml^{-1} with calculated biomass of 5,312 μm^3 ml^{-1}. These cells in the preserved sample from Loch Ore show a close resemblance to *Catena viridis* (Chodat, 1900), a green alga belonging to the Chlorellales (Trebouxiophyceae) as indicated by its morphology and size and based on detailed descriptions in authoritative sources: Bourrelly (1990), Tikkanen (1986) and Hindák (1978).

Bourrelly (1990) mentions *C. viridis* as being known only from Denmark, Sweden and France, with each end of the cylindrical cells widening into projecting edges encrusted with brown ferric salts, and with four or eight

Fig. 1. Cells from Loch Ore (August 2024). Scalebar = 10 µm.

of these cells forming short, straight or tortuous filaments. Guiry & Guiry (2024) state that this plankton alga is found in various freshwater habitats in central Europe as well as in Côte d'Ivoire in West Africa. John *et al.* (2011) quoted the comments of Williams (1941) concerning his record of *C. viridis* from the River Dee (near Chester, Cheshire, England) that the ring-like thickening was sometimes broken into granules. These observations were in error, since Williams (1965) subsequently corrected his identification to "*Amphikrikos minutissima*" [*sic*] (= *A. minutissimus*, a new species and genus described by Korshikov in 1953). John *et al.* (2011) describe *C. viridis* as having cylindrical cells, 3-4 µm wide, one to two times longer than broad, with ends often encircled by unequal caps or rings.

There is only a superficial resemblance between the rare chlorococcal alga *A. minutissimus* and the specimens from Loch Ore. The most recent morphological description and taxonomic comments on *A. minutissimus* refer to samples from Slovakia (Hindák & Hindáková, 2008). These authors described *A. minutissimus* as follows: "Cells solitary or arranged in 4-8 celled autosporangia, with indistinct hyaline mucilaginous envelopes. Cells were short cylindrical to cylindrical-oval, 5-7 × 2-3.5 µm… with a ring of irregular granules at both poles". Hindák & Hindáková (2008) also discuss the placement of *A. minutissimus* in the family Oocystaceae (order Chlorellales) based on the presence of autosporangia. In contrast, *C. viridis* reproduces only by transverse cell division and is now placed in the family Chlorellaceae (order Chlorellales) based on the findings of an 18s RNA investigation (Krienitz *et al.*, 2003).

An examination of detailed illustrations of both *C. viridis* and *A. minutissimus* from the unique Fritsch Collection, a detailed herbarium of millions of algal illustrations dating from 1912, also enabled comparison of the Loch Ore sample with different authors' interpretation of these two taxa. The cells of the Loch Ore sample more closely correspond to the illustrations of *C. viridis*, although these were not observed forming short chains, which possibly reflects the treatment of the sample after collection. As it was not possible to take a live sample from Loch Ore in August 2024, other aids to identification – the original colour of the cells and the nature of the chloroplast – remain unknown. The record of *C. viridis* therefore remains inconclusive.

Allan Pentecost (pers. comm.) suggested adding dilute acid to the sample to determine if the objects remained

– indicating they are algal, or if they completely dissolved – suggesting they were not algal but mineral. The addition of dilute hydrochloric acid resulted in the apical thickened caps dissolving but leaving the cells unaffected and intact (Fig. 2). All other algal cells remained unaffected and intact in the sample after the addition of acid. This further strengthens the case for these cells being attributed to the green alga *C. viridis*.

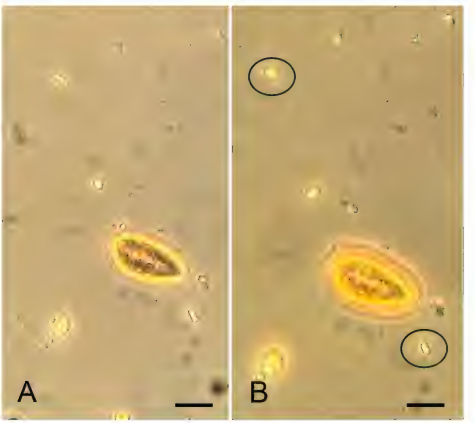

Fig. 2. Cells from Loch Ore (August 2024). (A) Prior to addition of dilute hydrochloric acid, showing thickened caps containing brown ferric salts. (B) Immediately after addition of dilute hydrochloric acid showing intact cells (encircled) and dissolved caps. Scalebars = 20 µm.

If the Loch Ore sample proved to be *C. viridis*, then it would be only the second time this species has been recorded from the British Isles, now that the original report of it from the River Dee is known to be erroneous (Williams, 1965). The only other record is the mention by Pentecost & Haworth (2021) that it was recorded by John Lund in 1996 from Priest Pot in a list of the freshwater algae of Cumbria that includes the English Lake District.

In conclusion, the cells observed in the sample collected from Loch Ore in August 2024 are very likely those of the rare green alga *C. viridis*, only the second time it has been recorded from the British Isles. Further collections of live material subsequently preserved in glutaraldehyde or formalin are needed for confirmation.

The authors thank the large number of algologists in the U.K. and further afield who provided valuable comments on JK's initial query about this specimen: Bill Brierley, Laurence Carvalho, Marko Järvinen, David M. John, Martyn Kelly, Sarah Pritchard, Kristiina Vuorio, and Allan Pentecost. Special thanks go to Joanna Wilbraham and Robert Mrowicki at the Natural History Museum (London) who copied relevant sheets from the Fritsch Collection of Algal Illustrations. Thanks are also due to two anonymous reviewers who provided very helpful comments on this note.

REFERENCES

Bourrelly, P. (1990). *Les Algues D'eau Douce. Initiation à la Systématique. Tome 1: Les Algues Vertes*. Lubrecht & Cramer Ltd., Paris.

Chodat, R. (1900). Sur trois genres nouveaux de Protococcoidées et sur la florule planktonique d'un Étang du Danemark. *Mémoires de l'Herbier Boissier* 8, 1-10.

Guiry, M.D. & Guiry, G.M. (2024). AlgaeBase. https://www.algaebase.org/search/species/detail/?species_id=34785 Accessed 23rd September 2024.

Hindák, F. (1978). *Sladkovodné Riasy*. SPN, Bratislava.

Hindák, F. & Hindáková, A. (2008). Morphology and taxonomy of some rare chlorococcalean algae (Chlorophyta). *Biologia, Bratislava* 63, 781-790.

John, D.M., Whitton, B.A. & Brook, A.J. (2011). *The Freshwater Algal Flora of the British Isles*. Cambridge University Press, Cambridge.

Korshikov, A.A. (1953). *Viznachnik Prisnovodnihk Vodorostey Ukrainsykoi RSR. Pidklas Protokokovi (Protococcineae). Bakuol'ni (Vacuolales) ta Protokokovi (Protococcales). Vol. 5*. Akademyy Nauk Ukrayins'koy RSR, Kyiv.

Krienitz, L., Hegewald, E., Hepperle, D. & Wolf, M. (2003). The systematics of coccoid green algae: 18S rRNA gene sequence data versus morphology. *Biologia, Bratislava* 58, 437-446.

Pentecost, A. & Haworth, E. (2021). *Freshwater Algae of Cumbria Including the Lake District National Park*. Freshwater Biological Association Scientific Publication No. 72. Freshwater Biological Association, Ambleside.

SEPA (2025). Water Classification Hub. https://informatics.sepa.org.uk/WaterClassificationHub/ Accessed 3rd January 2025.

Tikkanen, T. (1986). *Kasviplanktonopas*. Suomen Luonnonsuojelun Tuki Oy, Finland.

Williams, E.G. (1941). Two plankton algae of the Chester District. *Northwestern Naturalist* 16, 162-164.

Williams, E.G. (1965). Plankton algae from the Serpentine in Eaton Park, Chester. *British Phycological Bulletin* 2, 429-450.

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A brown lacewing *Hemerobius stigma* (Neuroptera: Hemerobiidae) in Glasgow Botanic Gardens, Scotland

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One specimen of the brown lacewing *Hemerobius stigma* Stephens, 1836 was found in the moth trap at

Glasgow Botanic Gardens, Scotland on 3rd October 2024 (Fig. 1). This is the first record for Glasgow, and one of rather few records in west central Scotland.

Fig. 1. *Hemerobius stigma*, Glasgow Botanic Gardens, 2024. Length (excluding antennae): 7 mm. (Photo: ©The Hunterian Museum)

H. stigma is distinguished by having a dark cross-vein MCCV (vein identification code) accompanied by shading on adjacent parts of the wing-membrane, and an orange pterostigma (an area on the leading edge of the wings); it is described as "one of the commonest species in pine woodlands, particularly associated with Scots pine (*Pinus sylvestris*)" (Plant, 2016). It is therefore perhaps not surprising that it is more commonly recorded in upland areas, though this may well be due to invertebrate monitoring in native pine woodlands. It is therefore likely to be under-recorded elsewhere. BugLife describe it as very common (C. Macadam, pers. comm.). The specimens held in the collections at the National Museum of Scotland and the Hunterian Museum support the view that most recording is done north of the Highland Line, though both collections include a significant number of records from the Central Lowlands of Scotland.

There are several pine species in Glasgow Botanic Gardens, including several specimens of Scots pine adjacent to the Children's Garden, some 100 m from the location of the moth trap. This is the first record for the Gardens and for Glasgow, though there are earlier records from west central Scotland generally. A 1989 sighting on Little Cumbrae (E.G. Hancock) was thought have been blown onto the island from the Ayrshire mainland, and there are 19th century records from Carluke, Lanarkshire (K.J. Morton), Bishopton and Johnstone, both Renfrewshire (A.A. Dalglish), and Ardentinny, Loch Long, Argyll (J.J.F.X. King). The 19th century records are transcribed from King (1901), and there are further west central Scotland specimens of King's in the Hunterian collection from Bonhill, Devol Glen (Port Glasgow), Helensburgh, Johnston Castle Woods, Mugdock Woods, Troon and West Kilbride. All the records mentioned are held by the Glasgow Museums Biological Record Centre database. However, only the Little Cumbrae record is currently shown on The National Biodiversity Network Atlas, which also shows a further record by R.K.A. Morris in 1992 at Falls of Clyde Scottish Wildlife Trust Reserve (NBN, 2024).

The Botanic Gardens record, along with the west central Scotland records from the Hunterian Museum, will be added to the NBN Atlas in due course. The specimen has been donated to the Hunterian Museum (Acc. No. 181356).

I am grateful to Jeanne Robinson for access to, and providing data from specimens in, the Hunterian Museum, to Ashleigh Whiffin for facilitating access to the National Museum of Scotland collections and SIRI (Scottish Insect Records Index), to Craig Macadam (BugLife) for helpful comments, and to Geoff Hancock (The Hunterian, University of Glasgow) for providing Fig. 1.

REFERENCES

King, J.J.F.X. (1901). Neuroptera–Planipennia. In: Elliot, G.F.S., Laurie, M. & Murdoch, J.B. (Editors). *Fauna, Flora and Geology of the Clyde Area*. University of Glasgow Press, Glasgow.

NBN (2024). National Biodiversity Network Atlas. https://species.nbnatlas.org/species/NHMSYS0000869712 Accessed 14th December 2024.

Plant, C.W. (2016). *A Key to the Adults of British Lacewings and Their Allies*. Field Studies Council AIDGAP Guides. Vol. 245. Field Studies Council, Shrewsbury.

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Woodchip wonders: bird's nest fungi in an office car park in central Scotland

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Fungus forays undertaken by the Clyde & Argyll Fungus Group (CAFG) since 2010 have added many new fungal records for its respective geographical area including numerous new records in and around the environs of Glasgow. Some of the more unusual fungi found in recent years from around Glasgow have been highlighted in a series of short notes in the Glasgow Naturalist (McInerny, 2019; O'Reilly, 2018, 2019, 2020, 2022; O'Reilly & Mitchell, 2019; O'Reilly & Mason, 2024; O'Reilly & Taylor, 2023).

Car parks are not usually considered as promising locations for new fungi records. However, most CAFG fungus forays commence in a city or country car park and there is a standing joke among members that it takes at least twenty minutes to leave the car park as enthusiastic forayers discover various fungus species

around its periphery.

The Scottish Environment Protection Agency (SEPA) has a large office and laboratory at Maxim Park, Eurocentral, North Lanarkshire, about 12 km east of Glasgow city centre. The area around the SEPA office building along Parklands Avenue is a regular haunt of the author for lunchtime walks and, in the autumn, mini fungus forays, with around 60 species of fungi having been identified using standard field guides (Sterry & Hughes, 2009; Buczacki *et al*., 2012; Watling, 1973). The SEPA office car park is bounded by grass verges and shrubberies but also contains a number of island flower beds. Surprisingly, it was the SEPA car park itself which revealed the most interesting fungal finds, which also happened to be one of the smallest. These were bird's nest fungi (Nidulariaceae), which were initially discovered in the car park flower beds while the author was kneeling down to look more closely at other nearby mushrooms. The beds were densely covered in woodchip mulch to suppress weed growth, with just one or two hornbeam trees (*Carpinus betulus*) and only a few scattered clumps of heather (*Calluna* sp.) (Fig. 1). It is the woodchips that provide a fertile substrate for the bird's nest fungi.

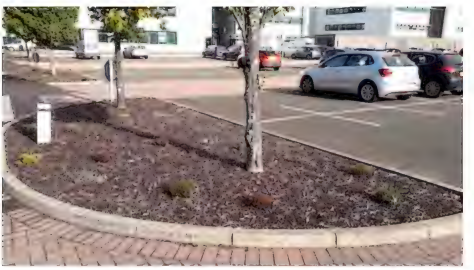

Fig. 1. Island flower beds at SEPA car park, Maxim Park, Eurocentral, North Lanarkshire, November 2021. (Photo: M. O'Reilly)

Bird's nest fungi differ considerably in structure from gilled mushrooms. Their taxonomy, morphology and biology were studied in detail by Brodie (1975), an eminent American mycologist (Saville, 1989). Their unusual fruiting bodies, first described as long ago as 1601, are comprised of small cups, initially covered by membranes which split open to reveal a group of lens-shaped "eggs" (peridioles), thus providing their common name. The eggs which contain the fungal spores, are splashed out of the cups by heavy rain drops up to a distance of around a metre (Hassett *et al*., 2013).

The bird's nest fungi in the SEPA car park were first observed on 28th October 2014 in a flower bed adjacent to the south-west rear corner of the SEPA building. They were rather small vase-like cups around 1 cm diameter occurring singly or in small groups or clusters (Fig. 2). A total of 47 cups was counted on woodchips scattered over just a few square metres of the flower bed. The bird's nest cups were quite difficult to see from head height amongst the mosaic of woodchip fragments. The

Fig. 2. Field bird's nest fungus cups (*Cyathus olla*), Maxim Park, Eurocentral, North Lanarkshire, October 2014. (A) Cluster of cups, which are about 1 cm in diameter. (B) Group of seven field bird's nest fungus cups with scattered peridioles; note cups lying on side on left. The cups are about 1 cm in diameter. (Photos: M. O'Reilly)

cups were pale brown with smooth flared rims and greyish eggs and were Identified as the field bird's nest fungus *Cyathus olla.* Loose eggs from the cups were scattered over the woodchips nearby.

A few days later, 11 more bird's nest fungi fruiting bodies were found on woodchips in a separate island flower bed about 10 m to the west. These were a little smaller and shorter, mostly immature with amber membranous caps still intact (Fig. 3). Just one cup had opened to reveal the eggs. The cup rim was narrow, without flaring, and the eggs were white, indicating these to be the common bird's nest fungus *Crucibulum laeve*. This species has several synonyms and is referred to as *C. crucibuliforme* by Laessoe & Petersen (2019).

No further bird's nest fungi were observed in the beds for quite a few years afterwards, perhaps due to repeated hoeing of the beds by the Maxim Park groundsmen. However, they made a re-appearance on 18th October 2021. Both *C. olla* and *C. laeve* returned to the very same beds respectively as in 2014. Only nine *C. olla* were found in 2021, a few still with intact fawn caps, others open but somewhat damaged, presumably by grazing slugs. Around a hundred *C. laeve* were found mostly still with their amber caps intact, making them

Fig. 3. Group of six immature common bird's nest fungus cups (*Crucibulum laeve*) with intact amber caps, Maxim Park, Eurocentral, North Lanarkshire, October 2014. The cups are about 1 cm in diameter. (Photo: M. O'Reilly)

much easier to spot among the woodchips than the fawn capped *C. olla*. However, a few days later hundreds more *C. laeve* were found nearby in two other semi-circular island beds at the south-west end of the SEPA car park.

The *C. laeve* in the island beds were repeatedly observed through to the end of November, allowing good photographs to be taken of mature specimens with scattered peridioles nearby (Fig. 4). Some of these *C. laeve* persisted throughout the winter and were still visible in the middle of February 2022, though by then most of the cups were empty with most of the peridioles scattered alongside. It seems plausible that the island beds, almost bereft of vegetation, may have had minimal slug colonisation allowing these bird's nest fungi to survive undamaged for so long. Dozens of *C. laeve* re-appeared in the island beds in October 2022 but in Spring 2023 a major makeover of all the car park beds was carried out. The hornbeam trees were removed and the beds completely dug over and heavily planted with shrubs and a few rowan saplings. Almost no woodchip remained, and no bird's nest fungi have been seen since.

Records of bird's nest fungi in Scotland are widely scattered with rather few in or around the Glasgow area (NBN, 2025). The NBN Atlas shows fewer than 50 Scottish records for *C. olla*, with only two in the Glasgow area (Govan and Springboig), whilst *C. laeve* shows over 80 Scottish records with one record in Glasgow (Govan) and other nearby records in Kirkintilloch (East Dunbartonshire), Hamilton and East Kilbride (both South Lanarkshire). The Fungal records Database for Britain and Ireland (FRDBI) holds some additional old records of both species from the late 1800s in the Glasgow area (FRDBI, 2025) including one, in 1896, for *C. laeve* from the former 1888 Exhibition site in Kelvingrove Park (Stewart, 1900).

Although the natural habitat of bird's nest fungi would be fallen branches, twigs, and other plant debris, they appear to have adopted horticultural woodchips as an alternative substrate and the widespread use of

Fig. 4. Common bird's nest fungus cups (*Crucibulum laeve*), Maxim Park, Eurocentral, North Lanarkshire. (A) Group of around twenty, including immature capped stages and fully mature; November 2022. The largest mature cups are about 1 cm in diameter. (B) Group of nine common bird's nest fungus, mostly mature without caps; October 2021. The largest mature cups are about 1 cm in diameter. (Photos: M. O'Reilly)

woodchip mulch in ornamental beds provides a new habitat that may help the spread of these and other fungi.

There are three additional species of bird's nest fungi in Scotland: the fluted bird's nest *Cyathus striatus*, with NBN showing just 29 Scottish records with one in Govan and one in East Kilbride; the pea-shaped bird's nest fungus *Nidularia deformis*, with 26 records including one from near Glasgow (in Newton Mearns, East Renfrewshire) and one a few km north-west of Balloch, West Dunbartonshire; and the dung bird's nest *Cyathus stercoreus*, which is restricted to a single site near Glenluce, Wigtonshire.

Quite a few different fungi species may now be taking advantage of the woodchip mulch including bird's nest fungi and collared earthstars (Sterry & Hughes 2009; O'Reilly, 2011). The woodchipped beds in the SEPA car park had other distinctive mushroom species including several redlead roundhead *Leratiomyces ceres* (formerly known as *Stropharia aurantiaca*) and numerous yellow fieldcap *Bolbitius titubans,* both now well-known from woodchip mulch. Although Sterry & Hughes highlight half a dozen "woodchip fungi" species in a special section they do not include these latter species or bird's nest fungi among them. Bird's nest fungi are probably overlooked due to their small size and hence under-recorded. A recent account of the unexpected discovery of bird's nest fungi in a mulched border at an urban fast-food outlet at Cameron Toll Shopping Centre in Edinburgh is given by Diekonigin (2020).

It is hoped that this note will encourage naturalists to take a closer look at woodchipped beds in the autumn and perhaps add new records of bird's nest fungi or other interesting species.

Thanks are due to Cameron Diekonigin and Richard Weddle for helpful information.

REFERENCES

Brodie, H.J. (1975). *The Bird's Nest Fungi.* University of Toronto Press, Toronto, Canada. https://doi.org/10.3138/9781442632516

Buczacki, S., Shields, C. & Ovenden, D. (2012). *Collins Fungi Guide. The most Complete Guide to the Mushrooms & Toadstools of Britain & Ireland.* Harper Collins Publishers, London.

Diekonigin, C. (2020). (Honorary) Plant of the Week - 7th December - Bird's Nest Fungus, *Cyathus olla. Botany in Scotland.* https://botsocscot.wordpress.com/2020/12/06/honorary-plant-of-the-week-7th-december-birds-nest-fungus-cyathus-olla/ Accessed 8th January 2025.

FRDBI (2025). Fungal Records Database of Britain and Ireland. https://www.frdbi.org.uk Accessed 19th March 2025.

Hassett, M.O., Fischer, M.W.F., Sugawara, Z.T., Stolze-Rybcynski, J. & Money, N.P. (2013). Splash and grab: biomechanics of peridiole ejection and function of the funicular cord in bird's nest fungi. *Fungal Biology* 117, 708-714. https://doi.org/10.1016/j.funbio.2013.07.008

Laessoe, T. & Petersen, J.H. (2019). *Fungi of Temperate Europe.* Princeton University Press, Princeton, New Jersey, U.S.A.

McInerny, C.J. (2019). The collared earthstar in the Glasgow area, Scotland. *The Glasgow Naturalist* 27(1), 73-75. https://doi.org/10.37208/tgn27115

NBN (2025). National Biodiversity Network Atlas, Scotland. https://scotland.nbnatlas.org Accessed 5th January 2025.

O'Reilly, M. (2018). Giant puffballs in Queen's Park, Glasgow. *The Glasgow Naturalist* 26(4), 94-96.

O'Reilly, M. (2019). New records of coral fungi: upright coral *Ramaria stricta* and greening coral *Ramaria abietina* from central Scotland. *The Glasgow Naturalist* 27(1), 95-96. https://doi.org/10.37208/tgn27130

O'Reilly, M. & Mitchell, J. (2019). The powdercap strangler *Squamanita paradoxa*, a bizarre parasitic mushroom found for the first time in the Glasgow area. *The Glasgow Naturalist* 27(1), 91-93. https://doi.org/10.37208/tgn27127

O'Reilly, M. (2020). New records of sessile earthstars (*Geastrum fimbriatum*) and collared earthstars (*Geastrum triplex*) from the Glasgow area, Scotland. *The Glasgow Naturalist* 27(2), 82-85. https://doi.org/10.37208/gn27220

O'Reilly, M. (2022). The stinkhorn *Phallus impudicus* and the dog stinkhorn *Mutinus caninus* from around the Glasgow area, Scotland. *The Glasgow Naturalist* 27(4), 76-79. https://doi.org/10.37208/tgn27416

O'Reilly, M. & Taylor, E. (2023). The non-native scarlet berry truffle *Paurocotylis pila* in King's Park, Glasgow, Scotland. *The Glasgow Naturalist* 28(1), 25-26. https://doi.org/10.37208/tgn28113

O'Reilly, M. & Mason, R. (2024). First record of the salmon salad fungus *Guepinia helvelloides* in the Glasgow area, Scotland. *The Glasgow Naturalist* 28(2), 26-28. https://doi.org/10.37208/tgn28206

O'Reilly, P. (2011). *Fascinated by Fungi: Exploring the Majesty and Mystery, Facts and Fantasy of the Quirkiest Kingdom on Earth.* First Nature, Llandysul.

Saville, D.B.O. (1989). Harold Johnston Brodie, 1908-1989. *Mycologia* 81(6), 832-836. https://doi.org/10.1080/00275514.1989.12025673

Sterry, P. & Hughes, B. (2009). *Collins Complete Guide to British Mushrooms and Toadstools.* Harper Collins Publishers, London.

Stewart, W. (1900). Notes on the mycology of Kelvingrove Park. *Transactions of the Natural History Society of Glasgow* 5, 75-79.

Watling, R. (1973). *Identification of the Larger Fungi.* Hulton Group Keys. Hulton Educational Publications Ltd., Amersham, Bucks. https://doi.org/10.5962/bhl.title.106851

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Book Reviews

British and Irish Butterfly Rarities: Migrations, Extinctions and Introductions

Peter Eeles
Pisces Publications, 2023. 338 pages, hardback with many colour photographs. ISBN 9781913994105. £32.50

Peter Eeles produced his magnus opus *Life Cycles of British and Irish Butterflies* in 2019, detailing the current breeding species. When I reviewed it for *TGN* 27(3), I commented that he had omitted migrants which could become established, as well as species that had been lost from the British list but might return. This beautiful book is clearly the reason, as it tackles these very topics and therefore represents a companion volume. It concentrates on three groups of butterflies:
(1) Primary Listings: 25 species that are recognised migrants or have been lost to the British list;
(2) Adventive Species: A further 29 species that have arrived here from time to time – often by unknown means;
(3) Questionable Records: Ten species that are probable errors.

Like his earlier book, this is a superb publication full of gorgeous photographs and a text which is remarkably absorbing.

The Primary Listings group begins both alphabetically and taxonomically with the Apollo butterfly (*Parnassus apollo*). If the eyebrows of keen lepidopterists initially rise at the inclusion of this magnificent species, join the club. However, against all expectation, Eeles has discovered 20 references to specimens recorded in the U.K. – the last in 1986. While several early records are necessarily vague, others bear an aura of authenticity; a 1957 record was a squashed individual on the pavement of Tavistock Square, London, while a 1955 specimen caught at Folkestone is in a local museum. The entry for the Apollo is typical, running to ten packed pages. All stages of the butterfly are covered by multiple colour photographs with accompanying text. There is a map of its European distribution and photos of typical habitat. Nearly four pages are devoted to the sightings, with each considered in turn; three possible sources of the butterflies (southern Norway, the Eifel and Vosges Mountains) are discussed. Other butterflies in the Primary Listings group include the Camberwell beauty (*Nymphalis antiopa*), large tortoiseshell (*N. polychloros*) and scarce tortoiseshell (*N. xanthomelas*), as well as many fritillaries, blues, whites and browns. Species that have become famously extinct in Britain, such as the large copper (*Lycaena dispar*) and black-veined white (*Aporia crataegi*), are notable entries - the black-veined white receiving no less than 14 pages and its disappearance is described as one of our great butterfly mysteries; sections on these two butterflies also mention the many attempts at re-introduction. Where a species has irruption years, these are documented and discussed. Where a species has more limited appearances, each known sighting is mulled over. One key issue (resident or migrant?) is often debated at length.

The Adventive Species group are accorded less room, with 29 species being covered in 18 pages. Illustrations are limited to the adults. Many have appeared here through imported plants and foodstuffs and are unlikely to trouble the British List for long. But if you are of a betting disposition, may I recommend the geranium bronze (*Cacyreus marshalli*) as a potential exception. Originally from southern Africa, I have seen this small member of the Lycaenidae in many parts of the Mediterranean and Eeles gives dated sightings in almost every European country.

The Questionable Records section is also short but is notable for some lengthy discussions of individual claims, e.g. for the scarce copper (*Lycaena virgaureae*).

There is a short section at the end – Future Prospects – that deals with legal aspects (especially assisted colonisation) and some topics which all authors find obligatory (pollution, climate change, habitat degradation) as well as trends in migration which may reflect the number of recorders rather than the number of butterflies.

Apart from simple misidentification, many pitfalls are alluded to in the course of the book. Unscrupulous dealers (e.g. "an unprincipled man named Plastead") could pass off species collected on the continent as British in order to increase their rarity and price to collectors. The release of butterflies at weddings and funerals may involve colourful alien species from butterfly farms. Caribbean and Central American species such as the Julia (*Dryas julia*) or the owlets (e.g. *Opsiphanes* spp.) are clearly linked to fruiterers that stock bananas. People who collected both in Britain and abroad could muddle up the provenance of catches or move specimens around in their cabinets with confusing results.

That said, the new world monarch (*Danaus plexippus*) is firmly established in the Atlantic islands (I have seen adults and larvae on Tenerife), mainland Spain and Portugal. This is a robust invasion and it is heading north. Even more inexorable is the northward march of the map butterfly (*Araschnia levana*) notable for its two annual broods which are so utterly unalike. It colonised the whole of the Netherlands in 20 years, moving north at a rate of 15 km/year; in Finland it has managed 60 km/year. What it will do when it collides with the Channel remains to be seen.

If you bought Eeles' original book, you should certainly consider this one also. It is produced to the same very high standard and it really does act as a "part two". It also injects elements of history, detective work and evaluation which I found fascinating. Thoroughly recommended.

Tony Payne

Avian Architecture: How Birds Design, Engineer and Build

Peter Goodfellow
Princeton University Press, Revised Edition, 2024. 176 pages, hardback. ISBN 9780691255460.
£25.00

A revised and expanded edition of the original 2011 publication, the book has the same structure as that of the first edition, with a foreword from the consulting expert, in this case Professor Tony Williams rather than our own Professor Mike Hansell. After a brief introduction, nests are classified into ten types with a chapter on each, including an illustrated summary of that nest type followed by case studies across taxa and biogeographic realms.

Topics covered start from the most basic Scrape Nests, through Holes and Tunnels, Cup-Shaped and Dome Nests to the more complicated and sophisticated Hanging, Woven and Stitched Nests. Away from the nest as a safe structure to raise the young is a fascinating chapter on Courts and Bowers, although strangely this includes only a single example from New Guinea. The 12th and final chapter takes another excursion away from traditional nests to cover Edible Nests and Food Stores, with a detailed case study on the yellow-bellied sapsucker and its "orchards".

Much of content is the same as that of the first edition, but with subtle improvements. In some cases, new images of the featured species are used, others feature the same image but with greater detail and often with a richer colour palate. Illustrations are also in improved quality/clarity. I am sorry that the image of the parent wren in mid-flight, bill full of harvestmen, approaching a nest entrance full of open mouths in the first edition has been replaced, but nowhere else does the new edition suffer in comparison.

Where case studies have been retained from the first edition there are few changes to the text, probably an indication of how well the original was written. There have been changes to the presentation of the case studies, with white rather than buff background and the removal of the unnecessary lines bordering the various sections of the case study. Strangely, nest measurements are now given primarily in imperial units rather than the original metric units.

New content is included, with additional case studies on species such as great tit, mandarin duck, wood warbler and Clark's nutcracker. Although the subject is avian architecture, the species accounts do not adhere completely to the topic: there are some fascinating side-notes on subjects ranging from the distraction displays of killdeer to interactions between the cactus wren and their predators the gopher and whip snake.

My favourite sections of the book are the regular illustrated features on how a particular nest is constructed – the "Velcro" technique of the long-tailed tit for example. Another lovely half-page figure which caught my eye was the explanation of how the horned grebe, normally clumsy on land, has evolved a nest structure and launching technique to most efficiently access its nest. My favourite illustration in the whole book is in the new case study of the white-necked rockfowl – a charming image of an adult with a bill full of mud. To my shame, this is the first time I had even heard of the species!

To summarise, a fascinating, well written and superbly illustrated book that would make a perfect present for the ornithologist in your life, or for anybody with even a passing interest in the natural world. Whilst much of the content is the same as in the first edition, there is enough new material and improvement from the original to make this a book worth investing in and treasuring.

Stewart White

Hedges

Robert Wolton
British Wildlife Collection No. 13. Bloomsbury Publishing, 2024. 400 pages, hardback with colour photographs. ISBN 0781399411714.
£36.00

Hedges continues the excellent standard of the British Wildlife Collection series. Perhaps the significance of hedges has been underestimated in the discussion of habitats, but this volume puts any misconception fully to rights. The author, Robert Wolton, is exceptionally well qualified to do the subject justice, having a diverse background as an ecologist, naturalist, researcher and farmer. Having specialised in farmland management, as well as being a hedge specialist for Natural England, his personal experience from running his own farm in Devon adds that anecdotal touch which makes *Hedges* such a readable book. The inclusion of many diagrams and excellent photographs adds to this.

The Preface and Acknowledgements begin with a general comment in which the author, viewing from an aeroplane, rejoices in the fact that, despite their depletion over the last 80 years, Britain and Ireland still have a landscape substantially defined by hedges. A large number of acknowledgements follow, including input from numerous organisations as well as personal acknowledgements that include his wife, Paula.

The first four chapters define a hedge, outline the history of hedges and examine cultural attitudes towards them, as well as assessing their current extent and condition. This section begins by referencing the definitive book on hedges (published in 1974) whose authors, Pollard, Hooper and Moore, worked for the Nature Conservancy at the time. Combined with the extensive works of Oliver Rackham, these provide an extraordinary

background to compare with more recent data and are much used in subsequent chapters. In 1974, hedges were still being removed following an attitude caused by food shortages during and post war, encouraging cultivation of all possible ground. This overview is followed by a chapter which poses the question "What counts as a hedge?" The answer is a working definition which includes not only the linear feature of trees and shrubs, but also the associated herbaceous vegetation. The third and fourth of these introductory chapters covers the detailed origins and history of hedges including diversity and related farming and cultural practices. Finally, superb data and analyses of losses and gains are presented, one conclusion being that we still have 700,000 km of hedges in Britain and Ireland. This could be dull, but the combination of maps, table diagrams and fascinating information remedies that possibility entirely.

The next group of five chapters deals with hedges as living systems with all their huge biodiversity. The first heading – Reservoirs of Life – sums this up, looking at the very many and diverse habitats afforded by single and multiple hedge systems, banking or no banking, and each one with its own character. In a countryside with so much intensive farming, the diversity of all forms of life associated with hedges is examined, enumerated and illustrated. The photographic material is a delight. Wolton pulls in experts where it is required, making good an historical lack of detailed hedges wildlife data. This too is examined in the context of species connectivity. The "heart" of a hedge, making diversity possible, is the shrub layer. Diversity, including climbers, makes every hedge more or less unique. Hedgerow trees add to the mix with an interesting conclusion that leaving occasional trees to reach height above the shrub layer can add much to the value and diversity. This leads to a discussion of "Bottoms, banks, margins and ditches" which increase diversity, with so much variety of plant and animal and fungal life. Life-cycles include those of butterflies, harvest mice, bats and bees and much more. Such well-illustrated examples make joyful reading.

Three significant ecological topics are considered next. The first looks at traditional uses of hedges as boundary markers and livestock control. This can be linked with the production of fruit, nuts and fodder, coupled with windbreaks for shelter for livestock, crops and dwellings. Fuel and construction increase the value of hedges too with each species having its own special value. I did so enjoy the anecdotal material such as a photo of slow herding cattle browsing their own choice of leaves of best medical value. Next is the consideration of hedges in soil conservation, cleansing water and reducing flooding. Hedges are beneficial in each of these problems which have become more pressing than ever before. The author backs these conclusions with his Devonshire farming experience as well as different country-wide examples. Hedges have been undervalued in so many ways, including the notion that hedge space simply reduces crops. However, in a chapter headed "Crop pollination and pest control" the author argues against this. The diversity of pollinators enhanced by the presence of hedges is examined and illustrated using data from Britain and several continental studies. Bumble bees and orchards are looked at from Normandy to Devon. Thanks to parasitic wasps and other natural predators, pest control can be enhanced too, allowing diversity and richness in habitat for so many creatures. "Do hedges have a significant role in carbon capture and storage?" is asked in the next chapter. This is a topic undergoing considerable research with immediate modern relevance. Hedges store carbon above and below ground and Wolton covers this topic well with data and evaluation. There is an overlap with the final chapter in this mixed section – the use of hedges for wood fuel. Balancing the saving on other fuels with the loss of carbon from hedges is ably covered in this chapter and perhaps those with open fires, wood burning stoves and enjoyment of bonfires should read with personal attention. It does make a very interesting read.

The penultimate chapter is by far the longest in the book – Hedge Management. This chapter is wide-ranging in its content, putting together all the aspects opened up and discussed in earlier chapters, and adding the extra impacts of time, opinion and regulation on hedge management. Hedges are changing living systems and almost certainly need some management. Left alone, they often become a row of trees. So, what is to be done? Problems, types of hedge, and the specificity of use are all looked at along with descriptions of methods and evaluations of control. Some conclusions might be counterintuitive: the flattening of tall hedges with big machines can actually work! Having worked in landscaping for many years and having a large garden with many hedge types and related issues, I did like this chapter a lot. For those who are really keen, excellent descriptions are given on how to construct and maintain all sorts of fancy layered hedges. A book in itself! The final chapter looks ahead. The author is optimistic. The public and organisations seem to be moving with the author. Hedges are being given due respect and consideration, hopefully leading to an improvement in their condition which is often badly needed. Finally, there are some data sets: "Key results from 33 local surveys in England, 2006-2010. Lists of Trees and shrubs and lists of Priority species significantly associated with hedges in the UK".

To conclude, I particularly like the way each chapter has a clearly defined topic heading, then an introductory statement of chapter content, followed by detail and finally "concluding remarks". This book covers a fascinating range of topics associated with hedges. It is extremely well written. Not only are complex data presented in tables and charts but the photographic content illuminates the text so well. This, coupled with the anecdotal examples makes it very readable. Consequently, I think this book's audience could extend from the professional wanting conclusive data and discussion right through to anyone at all interested in natural history. You might never have thought of hedges as being special; this will be a mind-changer, I'm sure.

Alison Moss

A History of Dinosaurs in 50 Fossils

P.M. Barrett
Natural History Museum, London, 2024. 160 pages, hardback with 76 illustrations, photographs and diagrams. ISBN:9780565095338.
£17.99

With over 1,000 known species of non-avian dinosaurs described and many more undescribed, this book successfully rationalises our current knowledge into easily digestible chapters. It is well written and easy to read and dip into. You don't need to read it from cover to cover, as each chapter (and dinosaur) is written as a stand-alone short story. A book entitled *A History of Dinosaurs in 1000 Species* would probably be too large to carry and too difficult to wade through. The choice of 50 dinosaurs is about right and slips neatly into the genre of other similar fossil-related books such as *The History of the Plants in 50 Fossils* or *The History of Life in 100 Fossils*.

Rather than attempt to write a compendium of all dinosaurs, this book identifies the key fossils that tell the complete story of our current understanding of dinosaurs. There will be many favourite dinosaurs not mentioned, nor illustrated, in the book, but that does not matter. What is crucial is the story of how we know what we know. As Barrett states: the book is an "accessible introduction to the many facets of current dinosaur science" and "not a definitive list".

The book starts with an introduction explaining the reasoning behind the book and how many of the examples stem from Barrett's own research at the Natural History Museum in London. There are few people more qualified to write a book such as this than Paul Barrett. He is a much respected and widely published leader of dinosaur research in the U.K. What he doesn't know about current research on dinosaurs could be written on the point of a pin.

The chapters are arranged in historical and stratigraphical order. The first dinosaur chapter covers *Megalosaurus*, the first scientifically described dinosaur (the centenary of this publication was in 2024). The following chapter explains what a dinosaur is, using *Mantellisaurus* as the example. After that, the dinosaurs are placed in stratigraphic order from their origins, with the non-dinosaur *Teleocrater*, to their extinction, with *Tyrannosaurus*. Throughout the other chapters we learn about the evolution and diversification of dinosaurs as well as their diets, armour, sounds, feathers, size, weapons and skin. Not only this, but we also learn about new techniques that are being applied to discoveries that help us find out more about how they looked and how they interacted with each other and their environment. The colour of their feathers is based on patterns and types of melanosomes – a relatively recent discovery in 2010. The eggs of dinosaurs can tell us more about dinosaur reproduction and parenting skills – as well as the gender of a dinosaur on those rare occasions when eggs have been found within the skeleton. New techniques applied to dinosaurs such as CT scanning help to unravel how dinosaurs could see and hear, and the shape and size of their brain. My own favourite (from my own stomping ground) was the image of a Scottish dinosaur footprint from the Isle of Skye on page 127.

I was relieved to see the photographs and illustrations are a good size allowing much detail to be seen. This is not always the case in many other dinosaur books which try to pack in as many dinosaurs per page as possible. The only issue I had with the images was that there are no scales to the images, so it is impossible to tell how big the fossils are without knowing them personally. An additional listing of the specimens with images at the back of the book is also a very useful reference.

As a dinosaur researcher, I find this book compelling; as a palaeontologist, I find it interesting; as a reader, I find it gripping; and the child in me finds it essential to satisfy my craving for all things dinosaur. I would recommend this book to anyone who enjoys fossils, dinosaurs, or general science.

Neil Clark

The Larger Moths of Scotland

Roy Leverton & Mark Cubitt
Triphosa Publications, 2024. 332 pages, hardback with colour photographs. ISBN 9781399976268.
£44.99

There are many books on the moths of Great Britain and Ireland, and it is perfectly possible to obtain books devoted to the moths of single English counties – Lancashire, Wiltshire, Surrey and Yorkshire for example – but volumes specifically dedicated to the moths of Scotland seem to be a different matter entirely. For years I have successfully used *Moths of the Forth and Tay & Loch Lomond National Park* by David Bryant as well as John Knowler's *An Annotated Checklist of the Larger Moths of Stirlingshire, West Perthshire and Dunbartonshire* but these are regionally restricted; nothing is available that deals with Scotland as a whole.

Now two very eminent Scottish entomologists, Roy Leverton and Mark Cubitt, have decided to take matters into their own hands with an ambitious privately published book of coffee-table format that details nearly 600 macro-moths found in Scotland. The achievement is a very substantial one, but they have had help; the Acknowledgements page (at the beginning rather than tucked away at the end) lists nearly 60 people who have provided assistance, and more than 70 who have helped with illustrations. These lists are a roll-call of many of the great and the good in Scottish lepidopteran circles and this enhances confidence in the final product.

The book begins with a 12-page section covering general issues including the factors that influence the frequency and distribution of moths in Scotland (geology, altitude, summer and winter temperatures, annual rainfall), the origin of moths after the last Ice Age, Scottish races, recent gains and losses (gains far outnumber losses), and the history of moth recording and record keeping. The introductory section ends with

a "how to use this book".

Each species account begins with a paragraph of what the authors have decided they want you to know. This can vary, and the Hepialidae are a good example. For the map-winged swift (*Korscheltellus fusconebulosa*) the general account concentrates on its appearance, for the common swift (*K. lupulina*) it is a caution not to confuse the moth with the bird of the same name, for the gold swift (*Phymatopus hecta*) it is entirely devoted to communal lekking. Idiosyncratic and unpredictable perhaps, but not in a bad way. There then follows a paragraph on range, distribution and habitat accompanied by a map of Scotland showing records. A short paragraph looks at trends in frequency, listing the records pre-1970, 1970-99, post 2000. These are invariably interesting but one wonders if they mirror moth numbers or recorder effort; the authors always give their view as to numerical or geographical stability. There is a short paragraph on flight period with a calendar histogram. The final paragraph is entitled "Recording issues" and is full of fascinating insights. For the gold swift mentioned above, only seven were trapped at one site over a period of 32 years, while 60 were counted in ten minutes outside the trap; thus, for some species, trap records may give little insight into population density. For the map-winged swift (also mentioned above), the moth is so numerous in places that mis-identifications only affect the data sets of other Hepialidae species.

Each moth is represented by at least one good-sized colour photo of the adult in a natural pose. I personally find this far more useful than the more traditional "spread-eagled in the collecting cabinet" approach of yesteryear. In truth, there are not that many examples where the hindwing helps to identify the species. Where it does (e.g. the lunar yellow underwing (*Noctua orbona*)), the traditional open-winged view is given.

Only the brave would literally field-test this book – it is 12 x 9 inches and weighs nearly 4 lb – but I recently attended a moth-trapping event at Caerlaverock and found the entries gave me considerable additional insight. Three moths that certainly never appear in my Glasgow back garden are the Chinese character (*Cilix glaucata*), the yellow-tail (*Euproctis similis*) and the least yellow underwing (*Noctua interjecta*) – the first two because southern Scotland represents their northernmost British limit, but the last because it is largely absent from the central belt though it occurs on either side of it. Moreover, while both the Chinese character and yellow-tail have remarkably stable distributions, unchanged over at least the last 30 years, the least yellow underwing made a sudden (migratory?) leap into Scotland but requires open country near sandy coasts.

There is a table devoted to "plausible additions" to the Scottish list and adventives brought in by design or accident. The authors suggest that a worrying development is spoof claims, backed up by photographic evidence, and one wonders whether AI will have any serious impact in the future. There are at least 200 papers in the references section and the usual indexes of Latin and English names.

Everyone interested in moths in Scotland should own this excellent book, but it is not just for Scottish lepidopterists. There is plenty here for enthusiasts all over Britain and even further afield. It represents a labour of love which is authoritative, insightful and highly recommended.

Tony Payne

A Guide to the Pyralid and Crambid Moths of Britain and Ireland

Mark Parsons & Sean Clancy
Atropos Publishing, 2023. 508 pages, hardback with many colour photographs. ISBN 9780955108648. £80.00

Following hard on the heels of the second (and enlarged) edition of the *Field Guide to Micro-moths of Great Britain and Ireland*, by Sterling, Parsons and Lewington, this book focuses on two of the larger micro-moth families which together form the superfamily Pyraloidea. The group includes moths such as the tiny grass-moths (e.g. *Chrysoteuchia culmella*) that you might disturb when walking through long grass in summer, and larger, more colourful moths such as the small magpie (*Anania hortulata*) that initially might well be taken to be macro-moths, and indeed in species lists of former times, both families were included among the macro-moths.

In 1986, when Barry Goater published *British Pyralid Moths*, he reiterated what his predecessor Bryan Beirne had said in 1952: that the group was "comparatively neglected" by amateur lepidopterists (Beirne, 1952). Goater's book did also cover the Crambidae, and the current publication is testament to the success of that slim volume in stimulating interest in and recording of these families. The authors include a table of some 40 species added to the British list since 1986, and in these days of climate change there will no doubt be others in the coming years, so they helpfully include links to websites which will provide updates.

The book is an extraordinary effort by the authors that has resulted in a magnificent volume. There is an extensive introductory section outlining how the species accounts are organised, followed by useful labelled diagrams covering morphology, and notes on finding the moths, and related conservation issues. Over 400 pages are devoted to the individual species, each one having two or three pages covering both adults and larvae with copious photographs of both, a bar indicating flight-time, and a U.K. distribution map. The photographs of adult moths are mostly as they appear in life at rest, but some (mainly the doubtfully British and adventive species) are shown as pinned specimens – and there are nine full-page colour plates showing pinned specimens (with spread wings) of all species, similar to those in Goater. These colour plates are followed by photographs of genitalia of 181 species, a list of food-plants and

associated species, and lastly a list of vernacular names, based on those given in the latest edition of *Field Guide* mentioned above, but also giving a number of names formerly in use. On the topic of vernacular names, the authors stress the need always to add the scientific binomial, in view of the potential confusion resulting from some of the earlier names and others of unknown provenance.

I should also mention the Technical Editor, Mark Tunmore, and David Wilson, photographer, who contributed to making this book such a spectacular achievement.

REFERENCES

Goater, B. (1986). *British Pyralid Moths*. Harley Books, Colchester.
https://doi.org/10.1163/9789004632110

Beirne, B.P. (1952). *British Pyralid and Plume Moths*. Frederick Warne & Co. Ltd., London.

Richard Weddle

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OBITUARY

Norman Tait FRPS: photographer, natural historian and past president of GNHS. (10th August 1942 - 16th December 2024)

Norman Tait was an active member of GNHS from soon after joining the staff of the University of Glasgow until his death, following a period of illness on 16th December 2024, aged 82. Norman was interested in natural history from an early age. Professor Jim Dickson recalls meeting Norman on Arran in 1959 while both were botanising and, recognising a kindred spirit, encouraging him to join GNHS. When Jim joined the Botany Department of the University of Glasgow in 1970, he found Norman already there as photographer, a post he took up in the late 1960s, having taken evening classes in photography after leaving school. Alison Moss remembers that when she was doing her postgraduate research in the late 1960s, based both in the Botany (now Bower) Building and in the Mycology Unit in the basement of Chemistry (where she grew fungi on agar plates), Norman regularly came over to photograph her specimens. The technician in charge of mycology was Pearl McKenzie. Pearl and Norman married in 1971.

Norman was born in Wishaw in 1942, worked in Glasgow, and lived in Renfrew, which may explain the remarkable fact that he was a member of all three of the local natural history societies: Hamilton, Glasgow and Paisley. Fiona Murdoch reports that Norman was a founder member of the re-established Hamilton society, attending the first meeting on 19th January 1960, aged just 17, and over the years contributing many photographs, articles and talks: he and Pearl became honorary members in 2008 (Fig. 1).

Fig. 1. Norman Tait and Audrey Wallace celebrating the 50th anniversary of Hamilton Natural History Society in 2010. (Photo: courtesy of Fiona Murdoch)

Professor Richard Cogdell recalls the work Norman did as Botany Department photographer. From the 1960s to the 1990s, before new technology began to take over "when you wrote and submitted a scientific paper, you had to provide hard copies of the figures: Norman produced all of these. If you were going to present a seminar, you had to have slides made: Norman made all of these. If you went to a conference and needed a poster, Norman made it. He was central to our success in those days. His passion, though, was photographing plants and insects. Every few years, he would give a seminar and present his pictures. He was remarkably skilled. Indeed, now in the Bower Building, several of his beautiful pictures are on the walls in the central atrium."

Richard Sutcliffe remembers visiting Norman in his office and darkroom in the Botany Department, where he was usually smoking his pipe while looking through newly developed photographs. He was a perfectionist. On one occasion he put his scissors through almost all of 36 slides he had just had processed. Only one or two of them were good enough for his high standards.

Norman's dual skills and interests in photography and natural history made him much in demand on the local scene, where he gave many lectures both to natural history societies and camera clubs, and judged in photographic competitions. Duncan McEwan reports that, when the Paisley International Colour Slide Exhibition introduced a nature section in 1975, Norman became an annual entrant (except in the four years when he was a selector), gaining many awards, including twice providing the Best Scottish Entry. He also prepared and delivered a commentary on the natural history slides for several years. Duncan especially remembers an image of a lacewing taking off, using a multi-flash technique that was particularly impressive for the time. In 1980, Norman was made an Associate of the Royal Photographic Society, and in 1982 he was awarded a Fellowship, the ultimate accolade (Fig. 2).

Fig. 2. Purple hairstreak (*Favonius quercus*) feeding at an emerging acorn. (Photo: Norman Tait)

In GNHS, Norman is credited for work on the illustrations in *The Glasgow Naturalist* from 1994, when the journal started to be able to publish colour pictures, to 2002. Around this time, Norman was a constant presence on the Society's Council, including serving a term as President (1996-1998). He provided photographs for several important natural history books: *The Changing Flora of Glasgow* (2000), *The Flora of Renfrewshire* (2013), *The Flora of Lanarkshire* (2016), *The Amphibians and Reptiles of Scotland* (2016), and a book chapter in Scottish Ornithology Club's *The Birds of Scotland* (2007). His published papers demonstrate a wide breadth of interests: birds, insects, plants, habitats and history.

In more recent times, Norman became interested in the use of digital techniques in the restoration of photographic archives. He worked particularly on the early 20th century photographer and taxidermist Charles Kirk, restoring many of his pictures (loaned to him by Glasgow Museums for copying), and publishing *Kirk on the Craig* (2005), an account of Kirk's hazardous work photographing on the cliffs of Ailsa Craig. Roger Downie recalls Norman's kindness in restoring a very battered but sentimentally valued photograph of his wife Naomi's early 20th century ancestors. Norman's interest in historical aspects of photography and natural history was evident in two papers he wrote for the 2001 *Glasgow Naturalist* supplement celebrating the 150th anniversary of GNHS. For the centenary of the Andersonian Naturalists Society in 1985, Norman not only dressed in period costume, but also brought along a period plate camera and tripod (see *The Glasgow Naturalist* 23(6), 2001).

Norman was a knowledgeable and enthusiastic field naturalist, spending much time in and leading excursions to favourite local sites such as the Scottish Wildlife Trust's Glen Moss reserve near Kilmacolm and the Boden Boo woodland near Erskine Bridge (Fig. 3). Richard Weddle recalls Norman showing him holy grass (*Hierochloe odorata*) at its only Renfrewshire sites on the banks of the Cart: Norman wrote several articles on the local history of this species. Opportunities for exploring further afield came on Botany Department field courses to Tenerife and on the Glasgow Expedition to Papua New Guinea (1987), led by Jim Dickson and generously funded by the Trades House of Glasgow. The team collected orchids, begonias and ferns to be cultivated in Glasgow Botanic Gardens and then displayed in the Tropicarium of the Glasgow Garden Festival throughout 1988. Norman was the expedition's photographer and an album of his pictures is kept in the Trades House.

Fig. 3. Norman Tait (front right) leading a fungal foray to Boden Boo, near Erskine Bridge. (Photo: courtesy of OneRen)

For information and reminiscences included in this article we thank Pearl Tait, Professors Jim Dickson and Richard Cogdell, Duncan McEwan, Alison Moss, Fiona Murdoch, Kirsty Menzies, Richard Sutcliffe and Keith Watson.

Roger Downie and Richard Weddle

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PhotoSCENE 2024-25

PhotoSCENE Natural History Photographic Competition.
The annual PhotoSCENE competition is sponsored by Glasgow Natural History Society and the University of Glasgow School of Biodiversity, One Health and Veterinary Medicine. It aims to promote an interest in Natural History and the work of SCENE (Scottish Centre for Ecology and the Natural Environment, the University's field station at Rowardennan, Loch Lomond), promote linkage between the School and the Society, and provide pictures for publicity purposes. All entrants are thanked for making the effort to enter the competition. This year there was a welcome increase in student interest. There were 29 entrants to the competition and a total of 121 photographs was submitted. Of these 121 entries, 11 were awarded prizes totalling £770 by the judges, Professor Stephen Phillips, Roy Petrie and Andrew Wilson.

Andy Wilson

Overall winner:

Seán Kerr - Spotted flycatcher fledglings (*Muscicapa striata*). Recently-fledged spotted flycatcher juveniles, waiting to be fed by their parents, near Clyde Muirshiel Visitor Centre, Renfrewshire, Scotland, 27th June 2024.

Other prize winners:
These include the photograph by Leo Yokota, which was highly commended and features on the front cover, and that by Rebecca MacArthur, which was also highly commended and features on the back cover. Information on these photographs is provided on the inside front cover. The other prize winners and highly commended entries are shown below.

Second Prize winner:

David Stone - Great horned owl (*Bubo virginianus*), Sonoran Desert, Arizona, U.S.A., March 2024.

Third Prize winner:

Ziggy Macnaughton - Wasp (*Vespula germanica*), exploring the leaf litter, Perthshire, Scotland, summer 2024.

Highly commended entries:

Cate Wynn - Glass frog (Centrolenidae) at night under a leaf with its eggs, Tobago, Trinidad and Tobago, August 2024.

Chris McInerny - Marsh fritillary (*Euphydryas aurinia*), Taynuilt, Argyll, Scotland, 7th June 2024.

Maggie McCallum - Dock beetles (*Gastrophysa viridula*), Brig o' Turk, Perthshire, Scotland, 26th July 2023.

Scott Shanks - Redwood (Sequoioideae) at Dumfries House, Cumnock, Ayrshire, Scotland, May 2024.

Richard Sutcliffe - Peacock butterfly (*Aglais io*) feeding on *Sedum spectabile* in a garden in Bearsden, East Dunbartonshire, Scotland, 8th September 2024.

Ean Parry - Emerald damselfly (*Lestes sponsa*), Hamiltonhill Claypits, Glasgow, Scotland, 2024.

BLB Grant Awards in 2024

Investment income earned from the Blodwen Lloyd Binns bequest enables GNHS to provide funding to support projects that have a direct benefit for natural history in Scotland, and to some extent further afield. After careful consideration of grant applications received in 2024, GNHS Council awarded funds towards the following projects:

Recipient	Project	Award amount
Emma Burnside	University of Glasgow Remote Scotland expedition 2024.	£1,000
Lauren Wilson	University of Glasgow Egypt expedition 2024.	£1,000
Leo Yokota	University of Glasgow Thailand expedition 2024.	£1,000
Maria Shlyakonova	University of Glasgow Iceland expedition 2024.	£1,000
Simon Dalton Celis	University of Glasgow Tobago expedition 2024.	£1,000
Libby McLaughlin	Investigating the source of insect-borne disease in Edinburgh Zoo penguins.	£924
Rebecca McArthur	Investigating the correlation of phenological patterns of Canadian passerines with weather conditions and climate changes.	£200
Anna McGregor	Tracing the historical distribution of native oysters through placenames and historical records; adding a new source through the Argyll Estate Archives.	£750
Maria Jose Lopez Jara	Woodland restoration and consequences for viral pathogens of wild rodents.	£1,965

+

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PROCEEDINGS 2024

For each meeting lecturers' names and the title of the lecture is given. Most meetings took place within the University of Glasgow, at the building specified. One meeting was held at the Kelvin Hall.

January 9th
Lecture 1: "Offsetting biodiversity losses: can we mitigate the damage from major developments in biodiverse countries?" from Suzanne Livingstone. Boyd Orr Building.

February 13th
Photographic night: Andy Wilson presented the results of the annual PhotoSCENE competition. Boyd Orr Building.

March 6th
Expeditions Report Back, jointly with the University of Glasgow Expeditions Society. (Most expeditions are supported by the BLB Bequest). Graham Kerr Building.

March 12th
Annual General Meeting preceded by Lecture: "Mosquito vectors of avian diseases in Scotland" from Heather Ferguson. Boyd Orr Building.

April 16th
Lecture: "Beavers in Scotland: a 20-year journey" from Nigel Willby jointly with Paisley Natural History Society. Boyd Orr Building.

May 14th
Lecture 1: "The work of the Green Action Trust" from Louisa Maddison. Lecture 2: "The Castlemilk Project: nature and community" from Stuart Whittaker. Boyd Orr Building.

June 11th
Summer Social dinner held at Elena's Spanish Restaurant, preceded by a visit to Kelvingrove Park led by Colleen Turner.

September 10th
Lecture: "Past, present and future of conifer conservation" from Hannah Wilson jointly with Glasgow Treelovers and Friends of Glasgow Botanic Gardens. Boyd Orr Building.

September 21st
All day event related to the centenary of the Graham Kerr Building, opened in 1923. A contribution to Glasgow Doors Open Days Festival and University of Glasgow Explorathon with guided tours of the Graham Kerr Building, lecture on "The history and Transformation of Glasgow Zoology" from Roger Downie, self-led exploration of the Zoology Museum and an interactive display on regeneration of Scotland's oyster habitats. Graham Kerr Building.

October 8th
An evening of forensic bioscience jointly with the Royal Society of Biology as a contribution to Biology Week 2024. Lecture 1: "Natural justice: applying soil and ecological evidence in criminal casework" from Lorna Dawson. Lecture 2: "Fur and feathers: applying animal DNA evidence in criminal casework" from Lucy Webster. Kelvin Hall.

October 22nd
Lecture: "Orchids of Crete" from Christine Nicolson jointly with of Glasgow Botanic Gardens and the Scottish Orchid Society. Boyd Orr Building.

November 12th
Lecture: "David Douglas, plant collector – the best kind of clever, adventurous and energetic Scot" from Ann Lindsay jointly with Glasgow Treelovers and Friends of Glasgow Botanic Gardens. Boyd Orr Building.

December 3rd
Christmas Social dinner at Elena's Spanish Restaurant.

December 10th
Lecture: "Stora Karlsö island and the Baltic Seabird Project" from David Stone. Boyd Orr Building.

Excursions
There were ten of our own excursions and two joint excursions with the Clyde and Argyll Fungus Group.

Officers and Council elected at the 2024 AGM

President
Dominic McCafferty

Vice President
Nicole Digruber

General Secretary
Alison Park

Assistant Secretary
Vacant

Treasurer
Susan Futter

Winter Syllabus
Roger Downie

Excursions
Alison Moss

Membership Secretary
Richard Weddle

Librarian
Myles O'Reilly

***The Glasgow Naturalist* Editor**
Iain Wilkie

***The Glasgow Naturalist* Assistant Editor**
Ruth Maclachlan

Newsletter Editor
David Palmar

Section Convenors
Richard Weddle: Bio-recording
Alison Moss: Botany
Ann Ainsworth: Geology
Andy Wilson: Photography
Position of Zoology Convenor was unfilled.

Social Secretary
Pat Thomson

Councillors
Robyn Haggard
Janet Palmar
Emma Plant
Scott Shanks
Jessica Young

BLB Executive
Chair: Chris McInerny
Secretary: Alison Park
Treasurer: Susan Futter
Scientific Advisor: Dominic McCafferty
Technical Advisor: Richard Weddle
Financial Liaison: Kirsty Kennedy-Wylie

The Glasgow Naturalist

Information for Contributors

1. *The Glasgow Naturalist* publishes full papers, short notes and book reviews. All articles are peer reviewed by a minimum of two reviewers. The subject matter of papers and short notes should concern the natural history of Scotland in all its aspects, including historical treatments of natural historians. Details of the journal can be found at: www.gnhs.org.uk/gnat.html

2. Full papers should not normally exceed 20 printed pages. They should be headed by the title and author, postal and e-mail addresses. Any references cited should be listed in alphabetical order under the heading References. All papers must start with a short abstract of up to 200 words, which should summarise the work. The text should normally be divided into sections with sub-headings such as Introduction, Methods, Results, Discussion, Acknowledgements and References.

3. Short notes should not normally exceed two printed pages. They should be headed by the title and author's name, postal and e-mail address. Any references cited should be listed in alphabetical order under the heading References. There should be no other sub-headings. Any acknowledgements should be given as a sentence before the references. Short notes may cover, for example, new locations for a species, rediscoveries of old records, ringed birds recovered, occurrences known to be rare or unusual, interesting localities not usually visited by naturalists, and preliminary observations designed to stimulate more general interest.

4. References should be given in full according to the following style:

Pennie, I.D. (1951). Distribution of capercaillie in Scotland. *Scottish Naturalist* 63, 4-17.

O'Reilly, M., Nowacki, S. & Gerrie, E. (2018). New records of the white-banded grapple-worm. *The Glasgow Naturalist* 26(4), 96-97.

Wheeler, A. (1975). *Fishes of the World*. Ferndale Editions, London.

Smith, C.W., Aptroot, A., Coppins, B.J., Fletcher, A., Gilbert, O.L., James, P.W. & Wolseley, P.A. (2009). *The Lichens of Great Britain and Ireland*. (2nd edition). The British Lichen Society, London.

Grist, N.R. & Bell, E.J. (1996). Enteroviruses. In: Weatherall, D.J. (Editor). *Oxford Textbook of Medicine*, pp. 381-390. Oxford University Press, Oxford.

References with more than six authors: name the first six authors, then add "*et al.*"

5. References should be cited in the text as follows:

Single author: Pennie (1915)… (Pennie, 1915). Two authors: Grist & Bell (1996)… (Grist & Bell, 1996). More than two authors: Smith *et al.* (2009)… (Smith *et al.*, 2009). Multiple citations: (Pennie, 1915; Grist & Bell, 1996). Same author(s), publications in different years: (MacGillivray, 1840, 1855).

6. An organism's genus and species names should be given in italics when first mentioned. Thereafter only the common name is required. Please use lower case initial letters for all common names, e.g. wood avens, blackbird, unless the common name includes a normally capitalised proper name, e.g. Kemp's ridley turtle. The nomenclature of vascular plants should follow Stace, C.A. (2019). *The New Flora of the British Isles*. (4th edition). C&M Floristics, Stowmarket. Normal rules of zoological nomenclature apply. When stating distribution, it may be appropriate to give information by vice-county.

7. All articles must be prepared as a word-processed document in A4 format, double-spaced throughout, with margins of 25 mm, and 12 point Times New Roman font. Tables and the legends to figures should be typed on separate pages at the end of the manuscript.

8. Tables are numbered in arabic numerals, e.g. Table 1. These should be double-spaced on separate pages with a title and short explanatory paragraph underneath.

9. Line drawings and photographs are numbered in sequence in arabic numerals, e.g. Fig. 1. If an illustration has more than one part, each should be identified as, e.g. 9A, B etc. They should be supplied as digital images (minimum resolution 300 dpi in tif or jpeg format) either in separate files or on separate pages at the end of the manuscript**: they should not be embedded in the text**. A metric scale must be inserted in photomicrographs etc. Legends for illustrations should be typed on a separate page.

10. Articles should be submitted by e-mail to the Editor: Dr Iain Wilkie Editor@gnhs.org.uk

11. When submitting an article, authors should assure the Editor explicitly that all illustrations, including maps, do not infringe copyright law. **Articles will not be considered for publication without this assurance.**

12. When the article is accepted for publication, the author should return the corrected manuscript to the Editor as soon as possible. Final proofs will be e-mailed to authors and should be returned by e-mail as soon as possible. **Alterations at this stage should be kept to the correction of typographical or formatting errors. Proposals for more extensive alterations, which should be forwarded directly to the Editor, will be approved only in exceptional circumstances.**

13. A copy of the published article will be sent to the corresponding author as a pdf file. Offprints will not be supplied.

14. All submissions are liable to assessment by the Editor for ethical considerations, and publication may be refused on the recommendation of the Editorial Committee.

15. Authors must sign a publishing agreement giving the GNHS copyright for articles published in *The Glasgow Naturalist*. This is standard procedure for publishing in most scientific journals, and allows the article to be archived at the Biodiversity Heritage Library www.biodiversitylibrary.org/bibliography/38981#/summary